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The Cooling of Theatres and Public Buildings

Mechanical Refrigeration Design, with Solution of Problem for Installing Cooling Plant in 3000-Seat Theatre

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MECHANICAL refrigeration, as we know, provides a means of cooling the air so that the regular dining room, banquet hall and theatre are reasonably comfortable and suitable for service during the hottest part of the Summer. The same may be said also of banks, offices and such places of congested gathering as the New York Stock Exchange, etc.

In none of these places is there a desire to chill the air very much, but simply to make it feel *cool* on entering. Therefore some such plan as the following would be attempted:

The temperature of the exhaust air will be 80° F. when the outside air is 90°, 75° when the outside air is 85°, and 72° when the outside dry-bulb temperature is 80° F., and the relative humidity will not be greater than 60% when the temperature in the theatre is 80° and 65% when the air is 72° F. In none of these cases is the air cooled more than 10° and the result is a feeling of comfort on entering the building from the outside and not a sensation of chill.

The procedure in such cases of cooling is to use the same equipment for ventilation as for heating and ventilation, the air being washed and a certain percentage (50% to 67%) recirculated. Such cooling plants are of large capacities, requiring as they do about 2½ to 3 tons of refrigeration per 1000 cu. ft. per minute of fan capacity for localities similar to the summer conditions found in Chicago.

THE REFRIGERATING MACHINE

From the preceding it is evident that the cooling of air for auditoriums is by no means a simple one. The machine used is always a compressor, and for some time (at least in the middle west) the refrigerant has been carbon dioxide.* As the air in the spray chamber is seldom if ever cooled below 55° F. (using 47° water in the sprays) the machine can operate at the high boiling temperature of 30° to 32° F. In consequence the capacity is high as compared with the standard condition of 6° and the horse power per ton of refrigeration is reduced.

For some time the method of cooling has been to install direct-expansion piping at the entrance of the spray chamber, using an amount equal to 35 linear feet of 1¼-in. pipe per ton of refrigeration. The piping is used both to cool the entering air and to cool the water which is showered over the coils, this arrangement acting as a Baudalot cooler. With such an arrangement it would be out of the question to use ammonia because of a possible panic should some accident occur to these coils and ammonia gas enter the ventilating ducts.

The air leaving the spray chamber will have an assumed temperature of 55° and 100% humidity, but during the passage through the fan and the distributing ducts the temperature will rise about 8°, depending on the friction losses, which would give the air a dry-bulb temperature of 63° F. and a relative humidity of 75% at the point of entrance to the hall or the auditorium.

In theatres it has been common practice to use "mushrooms" and to deliver about 25 cu. ft. per minute per person, the air entering through the floor between the seats. The use of upward ventilation is due to the natural heat given off by the large number of closely-seated occupants which tends to make the air rise and to take with it the vitiated products of respiration. Such an air temperature is likely to cause discomfort at times.

The freshly-cooled air on rising mixes with the air of the room, absorbs heat and moisture and

*Danger from CO_2 is almost nil should a break occur in the direct expansion piping. Tests by the Board of Trade on the S. S. Braemar Castle indicated that no trouble developed when the entire charge of CO_2 was released in the engine room, nor were lighted candles affected in any way.

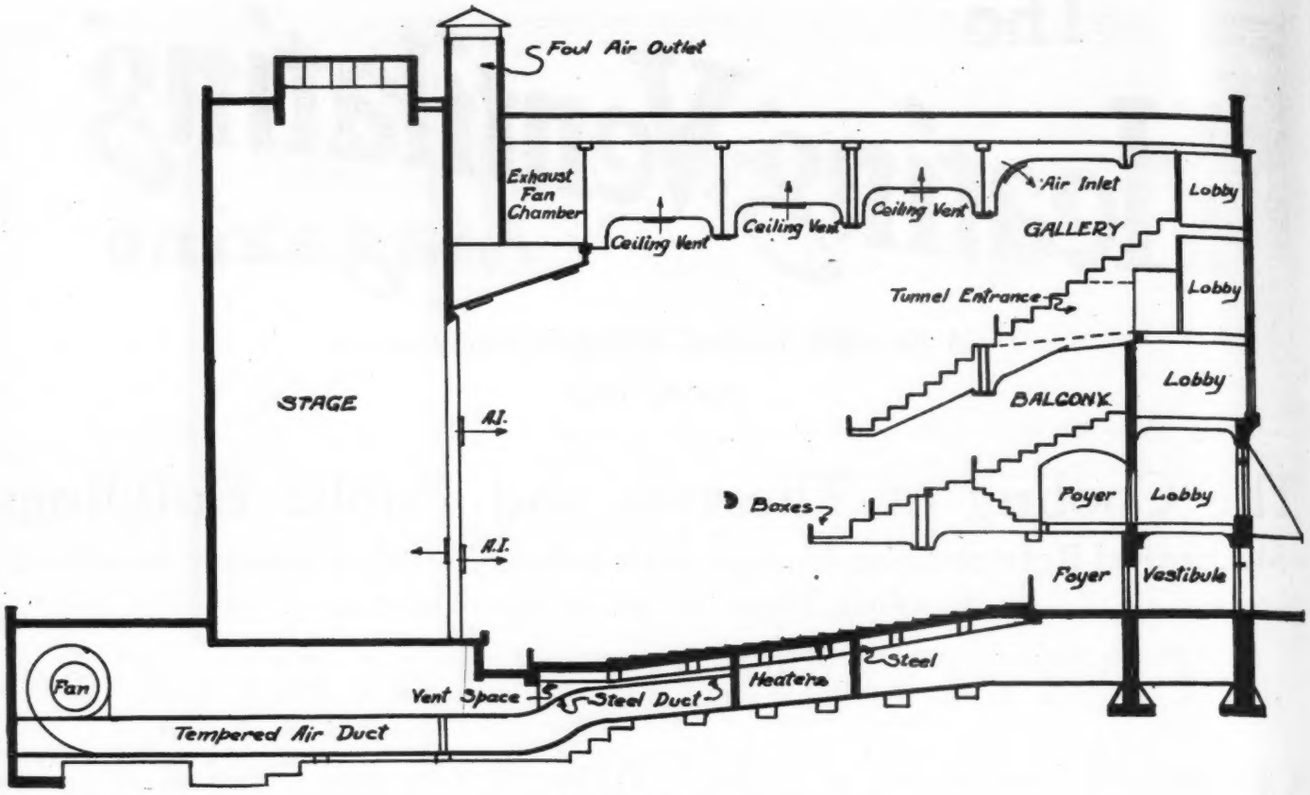


Fig. 1. Typical Arrangement for Cooling and Ventilating Theatre.

(if the proper amount of air is supplied per unit of time) the condition around the breathing line will be the required amount of 80° F. and 60% relative humidity. The exhaust will be located, if the mushrooms are on the floor, at the high point of the balcony or the ceiling. In the banquet hall or the dining room the air will be designed to enter from registers in the walls—some 6 or 7 ft. above the floor—or from registers in the columns.

THE SPRAY CHAMBER

The air is cooled by means of water, using a spray nozzle under 18 to 25 lbs. per square inch pressure. The number of nozzles to be used depends on the amount of water required and the capacity of the nozzle at the pressure used. Roughly some 8 gal. per 1,000 cu. ft. per minute is used by one concern, and 1 lb. of water per pound of air is used by another. As the water is permitted to rise about 8° F. the required amount of water is

$$200/8 = 25 \text{ lbs. per ton per minute.}$$
$$= 3.0 \text{ gals. per ton per minute.}$$

A Carrier nozzle, with a 3/16-in. opening, will deliver 15 lbs. of water at a pressure of 20 lbs. per square inch, and 17 lbs. at a pressure of 25 lbs. per square inch, whereas a ¼-in. opening will deliver 26 and 29 lbs., respectively, at these pressures. The Webster and the Sturtevant nozzles have about the same capacities. The size of the spray chamber is determined from the consideration of the limit of the air velocity in the chamber to 500 ft. per minute. In order to prevent moisture from passing out of the spray chamber and into the ducts, eliminator surfaces are installed. The amount used varies in the different designs from 20 sq. ft. to 35 sq. ft. per 1,000 cu. ft. of air (calculated for one side of the eliminator surface only).

PROBLEM IN DESIGN OF COOLING PLANT FOR 3000-SEAT THEATRE

It is desired to install a cooling plant in a 3,000-seat theatre for summer conditions of 90° F. dry-bulb and 60% relative humidity. A typical case showing the usual practice will be taken, keeping in mind that any specific case can be calculated for heat leakage, effect of sun's rays, illumination and other factors when the location of the building is known. The air in the theatre is to be kept at 80° F. dry-bulb and 50% of the air is to be recirculated. The amount of heat emitted by each person will be taken as 7* B. T. U. and the amount of water vapor as 18.9 grains per minute. Also the illumination will be taken as giving a heating effect of 1,500 B.T.U. per minute and the heat leakage through the walls and the roof as 3,000 B. T. U. per minute. The air leaving the spray chamber will be 63° F. thereby permitting a temperature rise of 17° as it absorbs the heat equivalent of the work performed by the fan and the sensible heat in the auditorium. The heating effect of the illumination is obtained by multiplying the number of watts by 0.0568 B. T. U.

		B.T.U.
The heating effect of the audience is	3,000 x 7.0 =	21,000
The heat leakage (assumed) is		3,000
Illumination (assumed) is		1,500
Heat equivalent of the work of the fan (estimated at 45 H.P.)		1,910
Total		27,410

*The value of 7.0 B. T. U. is larger than is sometimes used, but frequently the audience will enter in a heated condition, thereby emitting more heat than would be expected during rest.

The specific heat of the air at 63° F. and saturated with moisture is 0.2472 B.T.U. As the rise of temperature is 80-63 = 17° F. the heat absorbed by 1 lb. of the air is 17 x 0.2472 = 4.20 B.T.U. The total amount of air which must be circulated by the fan to absorb this 27,410 B.T.U. per minute is 27,410 ÷ 4.20 = 6,530 lbs. The volume of 1 lb. of air at 63° F. and saturated with moisture is 13.43 cu. ft. The total volume of the air at the *fan* per minute is, then, 6,330 × 13.43 = 87,700 cu. ft., and the amount supplied to each person (if at 63°) is 87,700 ÷ 3,000 = 29.2 cu. ft. per minute, but before this air gets to the breathing line the fresh air will be mixed with the other air in the room and the temperature will rise to or near 80° and the volume will increase in proportion.

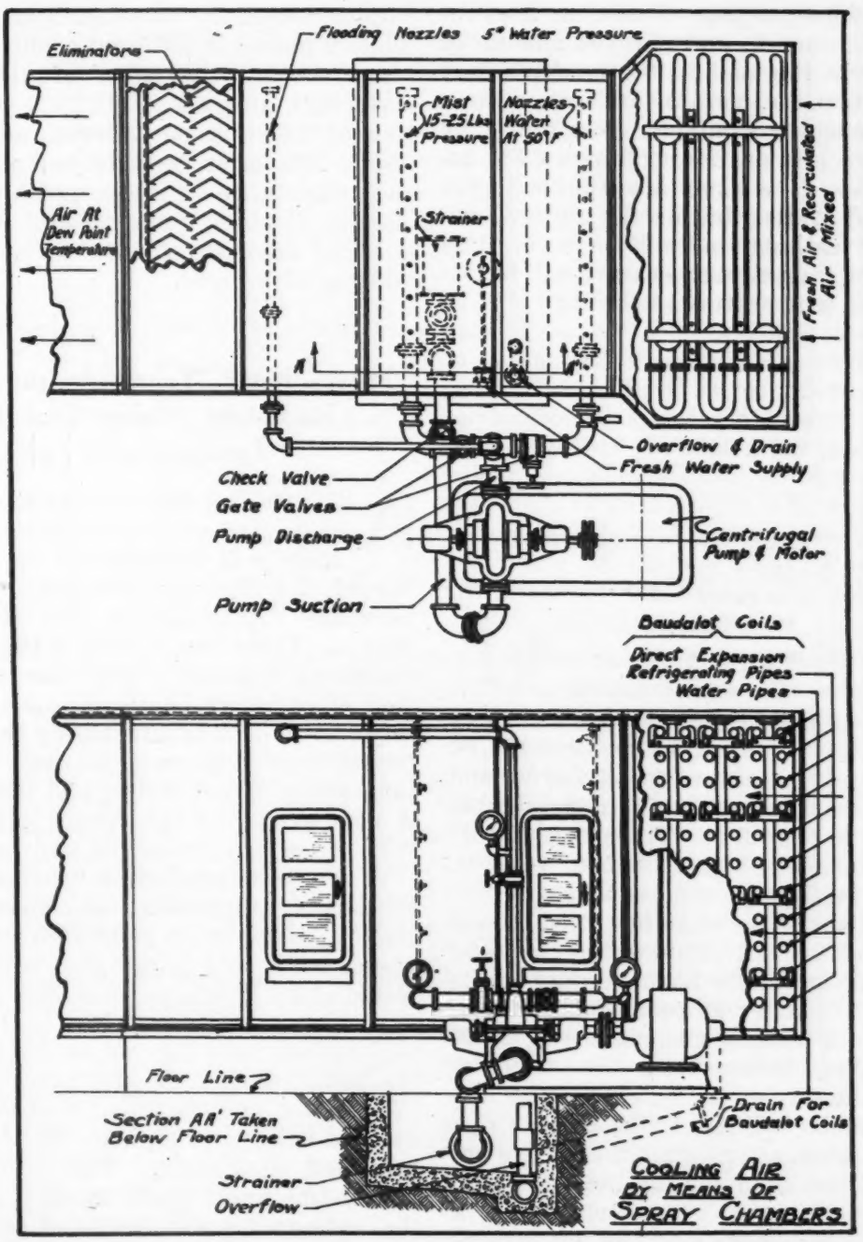


Fig. 2. Arrangement of Coils at Entrance of Spray Chamber for Cooling Both Water and Air

THE REFRIGERATION REQUIRED

The amount of the water vapor emitted is 18.9 x 3,000 ÷ 7,000 = 8.1 lbs. per minute, and the refrigeration required to condense this amount will be 8.1 × 1,061 = 8,600 B.T.U. thereby making a total of 36,000 B. T. U. per minute which would need to be removed from the air if all of it was to be recirculated. As one-half is to be recirculated and the other half is exhausted there will be 18,000 B. T. U. per minute of refrigeration required for the air that will be recirculated. The fresh air will enter at 90° F. and 60% relative humidity, which corresponds to a wet-bulb temperature of 78.3°, a dew-point of 74.2°, a moisture content per pound of dry air of 127 grains and a total heat above 0° F. (Carrier's chart) of 40.9 B.T.U.

The total heat of the air at a wet-bulb temperature of 63° is 28.0 B. T. U., and the total cooling effect of 40.9-28.0 = 12.9 B.T.U. is required of the refrigerating machine per pound of dry air. One-half of the vitiated air will be exhausted from the theatre and the other half will be washed and cool-

ed and recirculated. The weight of the fresh air will be 6,530 ÷ 2 = 3,265 lbs. per minute.

The refrigeration required of the machine to cool this amount of air will be 3,265 × 12.9 = 42,100 B.T.U. and the total demand on the cooling machine becomes 42,100 + 18,000 = 60,100 B.T.U. Adding 5% for safety the amount becomes 63,100 B.T.U., or 315.5 tons of refrigeration.

It is clear from the calculations that the recirculated air requires less cooling effect than does the fresh air from the outside, and that the amount of recirculation affects the load on the machine very decidedly. Therefore the operator has some reserve capacity in the machine available, on a pinch, by recirculating more air, as, for example, 67% instead of only 50%. It is likely also that with the mushroom method of distributing the air the temperature at the breathing line will be lower than that calculated, for the exit temperature will be 80° and very likely the temperature at the floor will be more nearly 78°.

If the spray water is delivered to the sprays at 50°, and leaves the chamber at 58° F. there will be required (as mentioned) 3 gal. per ton of refrigeration per minute of 3.0 x 315.5 = 946.5 gal. total per minute. It is usual to provide additional water capacity, say, 20% so that the capacity of the water pump would need to be 1,136 gal. If a ¼-in. nozzle is used (which has a capacity of 29 lbs. water per minute) with 25 lbs. per square inch pressure, the number of sprays will be $\frac{1136 \times 8.33}{29} = 328.$

Using a velocity of 500 ft. per minute air velocity in the spray chamber, there will be required 87,700 ÷ 500 = 175.4 sq. ft. of cross sectional area, and if this chamber is limited to 10 ft. in height the width would need to be 19.5 ft. The nozzles would be placed in two banks, 10 high and about 16 wide.

The accompanying illustration shows some coils at the entrance of the spray chamber, used to cool both the water and the air. This is the Baudalot type of coil and is especially liked because of its high value of heat transfer as compared with the submerged type, and because the surface is easily inspected for leaks. When used, the Baudalot cooler requires 35 linear feet of 1¼-in. pipe per ton of refrigeration, under which condition the value of k is 50. Some installations omit the sprays entirely except for those used for flooding the coils, and under this condition the chamber becomes a bunker-coil air-cooling room but the surface is always efficient on account of the continual wetting of the pipes.

Known and Unknown Factors in Heating Work

The whole field of heating and ventilation may be broadly divided into two parts: the first relates to the working properties of the materials and plant employed, such as building materials, radiators, boilers, pipes, fittings, fans, air ducts, and the like. The second, which is much more difficult, relates to the result produced by the plant.

One may say that many of the most obvious parts of the first section, which were uncharted ten years ago, have since been partly explored. I refer particularly to the heat losses through the best-known heavy building materials and some of the lighter structures which we and others have examined. We have also obtained a fairly complete survey of the gross total emission of heat from radiators in standard conditions. This is now being supplemented by investigations of emission of radiators placed in different conditions than the standard one—of the effect of different paints and coverings, and, above all, by a very complete analysis of the emission between radiation and convection. The latter research has a bearing of enormous importance on the second half of the field and has hardly been commenced.—A. H. BARKER, *before the (British) Institution of Heating and Ventilating Engineers.*

How Heat Transmission of Cast-Iron Radiators Varies Due to Varying Temperature Differences

A REPORT of tests on the heat transmission of cast-iron radiators recently conducted in Germany was presented at the last general meeting of the Heating and Ventilating Industry of Germany (XI Kongress fuer Heizung und Lueftung). These tests were made to clear up two questions, especially; first, how the heat transmission of radiators is affected by their location, and secondly, how it is affected by the variation of the temperature difference between the heating medium, steam or hot water, and the surrounding air. A comparison of the results given in the report with American standards will be of interest.

A new test installation was built for measuring the heat transmission. It consisted of a portable electric boiler which generated steam or hot water, respectively, and a radiator which thus could be tested at its location as installed and under normal operating conditions. The heat transmission of this radiator was figured as the difference between the heat from the electric current introduced into the furnace and the small heat loss from the well-covered boiler and piping. The latter loss was determined separately. This small and practical installation undoubtedly made it possible to extend the tests over a wide range of conditions.

The tests showed that, as a rule, the value of k, that is, the coefficient of heat transmission for a radiator, increases as the size of the room in which it is located decreases. Therefore: Large rooms—small k, and small rooms—high k.

The heat transmission, as a function of the temperature difference between the heating medium and the air temperature of the room can be expressed, according to the German report, by the general formula

$$(1) \quad H = rA\left(\frac{\Delta T}{144}\right)^{1.3}$$

wherein: H = total heat transmitted from the radiator.
A = heating surface of the radiator.
$\triangle T$ = temperature difference between heating medium and surrounding air.
r = constant for each radiator, independent on temperature difference.

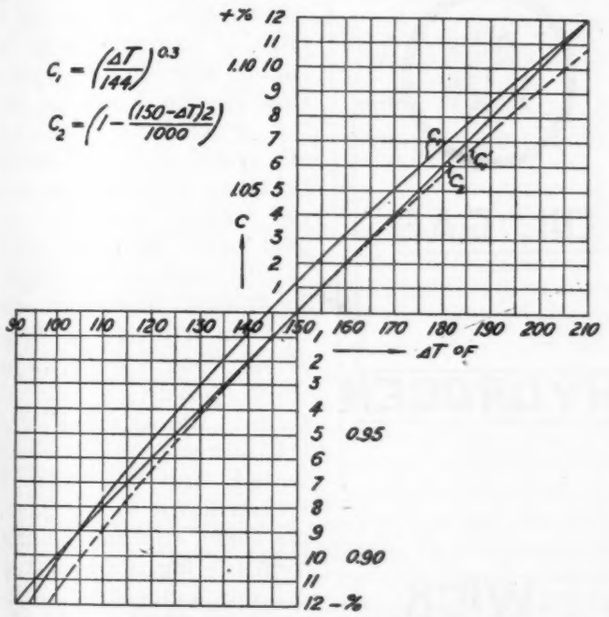
So far the German report.

(1) can be written in the usual way as:

$$(2)\quad H = \frac{r}{144}\left(\frac{\triangle T}{144}\right)^{0.3} A\ \triangle T$$

or $H = KA\ \triangle T$ wherein

$$(3)\quad K = \frac{r}{144}\left(\frac{\triangle T}{144}\right)^{0.3}$$



Comparative Curves for Variation of K Due to Temperature Difference

For the European standard temperature difference of $\triangle T = 80°\ C = 144°\ F$, K becomes

$$K_s = \frac{r}{144}\left(\frac{\triangle T}{144}\right)^{0.3} = \frac{r}{144}\left(\frac{144}{144}\right)^{0.3} = \frac{r}{144},$$

which is a constant for each radiator; and equation (3) can be written as:

$$(4)\quad K = K_s\left(\frac{\triangle T}{144}\right)^{0.3} = K_s\, c_1 \text{ wherein}$$

$$(5)\quad c_1 = \left(\frac{\triangle T}{144}\right)^{0.3}$$

We call K_s the value of the coefficient of transmission at the standard temperature difference and c_1 its correction for a temperature difference other than standard.

Let us compare this formula with the one generally used in the United States and established by the tests of John R. Allen. According to Allen's tests the correction of k can be expressed as very nearly 0.2% per degree above or below the standard range of 150° F. The heat transmission based upon this rule reads, therefore:

$$(6)\quad H = K\left(1 - \frac{(150 - \triangle T)2}{1000}\right) A\ \triangle T, \text{ wherein}$$

$$(7)\quad 1 - \left(\frac{(150 - \triangle T)2}{1000}\right) = c_2$$

c_2 is to be compared with c_1 of the formula based upon the German tests.

The chart shows the comparison of c_1 and c_2, that is, the correction of k in percent, c_1, starting from 80° C = 144° F, as from the standard European temperature difference, and c_2, starting from 150° F. as from the standard temperature difference in the United States. For comparison c_1, was transferred lower down to c'_1 in order to start from the same standard temperature difference. Around 150° F., both curves are nearly identical, whereas they differ at the highest and lowest ranges.

The curve of the recent German tests will be useful whenever very abnormal temperature differences are encountered.—DR.-ING. ERNST SCHMIDT, MUENCHEN, in *Gesundheits-Ingenieur*.

Degree-Days for Measuring Heating Requirements

"DEGREE-DAY" is a clever word-coinage, designating a unit by which heating requirements may be measured, and comparisons made between heating loads under different climatic conditions or at different points. It is the product of a degree of temperature, and a time factor of one day. In common with nearly all units, an empirical element is necessary, this being the zero point in the computations. So the American Gas Association, the source of the "d.d." unit, through a study of actual conditions, determined that the minimum temperature of bodily comfort in the home is reached when the mean daily temperature falls below 65° F. In other words, below this point, heat is required, as the average day-time temperature in the house drops below 70° F.

If, then, we have a mean daily temperature of 60° F., it is evident that, for this day, we can measure the heat requirements by the figure "5° days," whereas, had the mean temperature been 55° F., the heat requirement would be measured by "10° days," or would be twice as great. Summing up, therefore, for a week, or a month, or a heating season, we may express the aggregate heating load of any locality in units that permit comparison with that of any other point. Likewise, we may compare the heating requirements at any given place, during one heating season, with those of any other heating season. And so a "mild winter" or a "hard winter" becomes definable in accurate units that may be translated into B.T.U. Basing these units on the very accurate data of the weather bureau, a high degree of accuracy results.

The data sheets in this issue present heating data utilizing the "d.d." unit for the first time.

What Happens When We Burn Oil

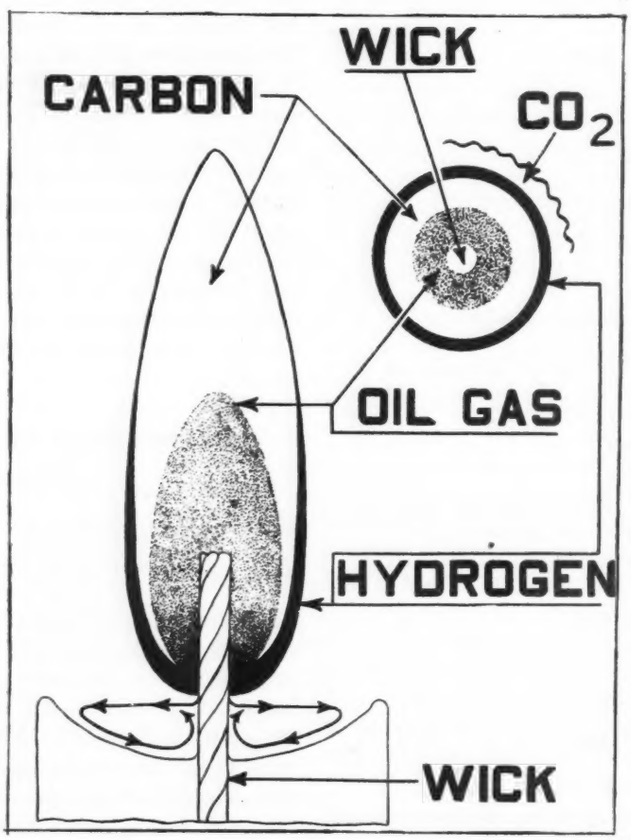
Importance of Oil Flame Analysis and Significance of Blue and Yellow Flames

By James L. Breese, Jr.
Breese Engineering Corporation

(From a paper presented at the annual meeting of the National Association of Oil Burner Manufacturers, Chicago, April 1-6, 1925

WHEN we attempt to burn oil we have before us the problem of first converting the hydro-carbon liquid into a saturated vapor, and then applying sufficient heat to bring it to a condition, called gaseous. A good description of this transition period, and a standard definition for the difference between oil vapor and oil gas, is as follows: "When a substance in a gaseous condition is at, or near the temperature at which it changes into liquid, it is called a vapor, and when it is far higher than this temperature, it is called a gas."

With this gas produced, our next problem is mechanical, that is, we must mix this gas with sufficient oxygen so that complete combustion can take place. So far, our steps have been in the field of mechanics. We now jump into chemistry. We must raise this mixture to a point where a chemical reaction will take place between the hydrogen and oxygen, and the carbon and oxygen. The oil gas and oxygen having been mixed, and then brought to a certain temperature, chemical reaction will take place rapidly. Here, we come to the critical point of combustion.



Theoretical Section of Candle Flame Illustrating Mr. Breese's Analysis.

If the steps above mentioned could be accomplished without the time element entering into the situation, oil flames would differ only in proportion to the percentage of oxygen to hydro-carbon present, but unfortunately we cannot dispense with the time element, and therefore we have many different types of flames, an analysis of which I hope will aid you in appreciating the problem of making your burners more practical and more efficient.

LOG OF WOOD THE ORIGINAL BUNSEN BURNER

Did it ever occur to you why the flame from a log of wood gives off no smoke, and still does not have either the blue flame of the Bunsen type burner, or the bright white flame, which we get from a forced draft burner? You all know that wood is composed of carbon and hydrogen and, when heated in the presence of oxygen, burns to carbon dioxide and water, exactly the same as oil, but if we light a pail of oil under similar conditions, we will obtain a dull red, smoky flame. I repeat, why the difference?

The answer is simple. An analysis of wood shows that an average of 40% of the wood is oxygen. In other words, a log of wood is the original Bunsen burner. As the log is heated, and the fiber is broken down to the gaseous form, the gas coming from the log is pre-mixed at a low temperature with oxygen. This is exactly what takes place in the Bunsen type burner, with which we are all familiar, as it is the type used in gas stoves, ranges and heaters.

If we could make our oil burners burn as cleanly, and with as little noise as a gas stove, or a wood fire, we would indeed have reason to be proud of our products, and, in the final analysis, there is no reason why we cannot do this, if we are willing to face the situation squarely and design mechanical means for giving us the results which nature has provided with the log of wood. In order to do so, a nice appreciation of what occurs to produce different types of flames, is the essential starting point.

CHARACTERISTICS OF BLUE AND YELLOW FLAMES

There are broadly two types of flames, the blue flame and the yellow flame, but there are many combinations of part blue and part yellow.

The blue flame indicates that the oxygen and the oil gas have been pre-mixed at a temperature below the temperature of ignition, or, as stated from the point of view of the result—the combination of

hydrogen and oxygen is going on at the same rate as the carbon and oxygen, and in step with each other.

The yellow, or radiant flame, is an indication that the mixing is being done above the ignition temperature, and after ignition has taken place, with the natural result that most of the hydrogen is united before the carbon starts, thus robbing the atmosphere of oxygen, and making the incandescent carbon rise and reach out for oxygen.

The blue flame means that combustion is taking place within the entire volume included within the flame, whereas with the yellow flame, combustion is taking place along the surface only. The surface I refer to is the dividing line between the oil gas and the air. The thickness of this area of combustion, of course, varies somewhat, but in a stream-line flame, in which eddy currents do not exist, I have measured the incandescent wall as about 1/32 in. thick, the layer immediately outside of this being mostly carbon dioxide for a thickness of about 1/16 in., and then the pure air.

The efficient and successful operation of an oil burner is dependent upon the manner in which the installation is made. It has been the common experience of nearly all companies that the most successful installations are made by men skilled in such work. Most burners so installed, are in their final analysis, set by eye. In other words, men with experience have found that certain settings of the burner give better results than others. There are some, a very few, who take the trouble to get a flue-gas analysis after an installation has been made, and then make the final adjustments, so that the flue-gas analysis shows a relatively high percentage of CO_2 without showing smoke.

CANDLE FLAME MOST WONDERFUL HEAVY OIL BURNER

A cross section of a candle flame, which after all, is the original and most wonderful heavy oil burner, discloses the following: Starting from the center, outwardly, we have first liquid oil, or paraffine in the center of the wick. Next we have a concentric ring of saturated oil vapor well below the ignition point. Then we have a ring of oil-gas on its outer edges, the temperature being up to the ignition point. The next ring is a very thin ring, not over 1/32 in., of incandescent carbon particles, kept in this state by the heat of the chemical reaction of oxygen from the layer of air and the hydrogen, which shoots through the incandescent wall and steals the oxygen. The next layer is rich in carbon dioxide from the chemical reaction of the air and the incandescent carbon. Finally there is the air itself.

Let us study the candle flame further, using this miniature burner, which gives perfect combustion and no noise on the dining room table, and see what would happen if properly installed in a boiler. In the first place, if we should put the candle in the center of the boiler, the first objection would be that it did not heat the house. The answer to this would be simple. Put in a larger candle. Now when we put in a larger candle, we increase the amount of oil gas given off, but do not supply any means for increasing the diameter of the circle of combustion; therefore, the flame must rise vertically in its attempt to reach out for oxygen. Let us suppose that in order to get enough heat from our candle, we have to put in such a large candle that the flame is carried up into the boiler surfaces. We now find that we would have a smoky flame, and soot would be deposited in the boiler walls, and up the chimney.

The next step then would be, logically, to secure a blower and blow additional air to the flame so that the oxygen could get into the incandescent carbon. Combustion would then be accomplished before the flame traveled to the top of the boiler.

TROUBLES DUE TO EXCESS AIR

The smoke trouble having been overcome, we are in more trouble. We find that if the blast of air

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is a little too hard, the flame blows out, or if it does not blow too hard, the chilling effect of too much air is liable to cool the upper end of the flame, and again produce smoke, though excess air is at hand. The problem is now getting interesting. We have found that the addition of air is not the cure-all, but the temperature and the velocity of this air is as important as the amount. The next step is usually to try the blow-pipe action, that is, to have a jet of air impinge on the flame, the diameter of the jet being relatively small with respect to the flame, so that a blast of air is thrown completely through the area formerly occupied by the flame. The suction action of this jet draws the balance of the flame into the path of the blow-pipe stream.

Good combustion always results from this method, and we think the oil burner is going to be a success. But soon a complaint is registered that the noise is excessive, and if we are engineers, not salesmen, further research is necessary.

RELATION OF AIR VELOCITIES TO FLAME TEMPERATURES

Now leaving our candle oil-burner for a while, let us examine a few of the successful flames and measure their temperatures, the velocity of flame propagation, and the velocity of the admitted air at the time it strikes the gas, at or above ignition temperatures. First, the log of wood, in which we have a mixture of hydrogen, carbon and oxygen brought up to the ignition temperature, and mixed with air at velocities no greater than that produced by 0.02 in. draft, say roughly 300 ft. per minute. At 0.045 to 0.05 in. draft, a wood fire will roar like some oil burners, or at a velocity of approximately 900 ft. per minute, the flame will leave the wood. If this velocity is not dropped, the flame will go out. Therefore the velocity of flame propagation for wood lies between 300 and 900 ft. per minute.

ANALOGY OF GAS JET

Next, take the gas jet. We find that if a relatively large amount of gas comes out of a round hole at low velocity, the gas flame will smoke. However, if we have two openings at 90° to each other, so that the two jets impinge and give us a relatively large exposed surface, the gas will burn without smoke. This is the common type of flat-flame gas jet. Here we have conditions different from the log of wood. Instead of moving the air rapidly over the surface of the gas generator, which was the log of wood, we move the gas at high velocity through the air and give it a large exposed surface to the oxygen of the air. In order to find the velocity of the flame propagation of this gas, it is merely necessary to allow the gas to escape from a small stream-lined orifice of even diameter, and increase the pressure at the orifice until the flame leaves this point. Ordinary city gas has an average tip velocity of 5000 or 6000 ft. per minute, and the flame will leave the tip at this velocity. We are beginning to get some data. Now turn to a highly-specialized form of flame, and see what we can discover there. I refer to the oxy-acetylene blow torch. Here we have a flame no larger than a dining-room table candle flame, but producing many times as much heat, and a much higher temperature. We find here that the velocity at which the gas and oxygen can be sent from the nozzle without the flame leaving the tip, is all out of proportion with what we found in the first two cases. Why is this? The answer is that the velocity of flame propagation is a function of temperature, and the reason for producing a higher temperature by the use of pure oxygen, is the fact that no nitrogen has to be heated and that the entire heat of combustion is produced in the cone of mixed oxygen and hydro-carbon. We also find, from the acetylene torch, that the blue flame gives a higher temperature, whereas a yellow flame gives more radiant heat.

COLOR OF FLAME LARGELY A MATTER OF ITS APPLICATION

Without burdening you with the measurements of this proportion, it will be enough to state that the total amount of heat generated is the same, and that in the design of our final burner the decision as to whether we will have the blue flame or a yellow flame is largely a matter of the application of that flame. We now have enough data to analyze the flame produced by our burner to see whether or not we are accomplishing the results for which we designed the structure.

Suppose we have in mind a blue-flame burner. To obtain a blue flame, we have found that it is necessary to pre-mix the oil gas with air. We know the temperature of saturated oil vapor, and we know the cracking temperature of this vapor. So the problem is merely to arrange mechanical means for producing and mixing the oil vapor and air between these two temperatures, bearing in mind that as we increase the temperature beyond the minimum temperature of saturation, our flame propagation velocity will increase, and, in order to keep the flame from burning back into the mixing chamber, tip velocities must be kept above the velocity of flame propagation for the particular mixture and temperature chosen. This is usually done by using small apertures, and a large number of these, to give the air surface necessary. This type of flame is well adapted to boilers with small flue passages, and applications, such as melting pots, where high temperature is required and small surfaces are available for heat absorption.

YELLOW-FLAME BURNER MORE GENERALLY ADAPTABLE

The yellow-flame burner is more generally adapted to all classes of work, except melting pots, and is therefore the type usually attempted. Let us review the data we have obtained, and now construct our yellow-flame burner. First of all, the data from the log of wood has to be thrown out, as this presupposes a primary mixture of hydro-carbon and oxygen, but we can apply what we learned from the candle and the acetylene torch.

(*Continued On Page* 62)

This is the eighth lesson of

The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Instruction in this course is available only to subscribers of The Heating and Ventilating Magazine. The first lesson appeared in the November, 1924, issue. However, students can commence the course at any time. Immediately upon receipt of your enrollment, Lesson 1 will be sent to you, together with the Work Problems pertaining to Lesson 1. Full directions will be included as to where to send your solutions of the Work Problems.

The complete course consists of not less than 30 lessons. The first five lessons are devoted to the fundamentals of heating and ventilation. The second section, commencing with Lesson 6, is devoted to gravity water heating. This will be followed in due course by sections on radiators and radiation, gravity steam heating, steam and water boilers and cost estimating.

The cost of the complete course, including a critical analysis of the Work Problems as solved by each student, is $80.00, payable in equal monthly installments of $10.00. An enrollment blank will be sent you upon request, together with full directions for securing all the benefits of the course.

Students who satisfactorily complete the course will be awarded a Graduation Certificate which will correspond in value to the character of the lessons themselves.

Lesson No. 8—Up-Feed, One-Pipe Water Heating System

THIS type of water heating system is quite generally used, especially for buildings larger than residences where an up-feed hot water system is to be installed.

Fig. H-3-1 shows a typical layout with three banks of radiators. The supply main should be started close to the basement ceiling just above the boiler, as at point X, and should grade in the direction of flow downward uniformly ¾ in. in 10 ft.

The supply main should not be reduced in size as branches are taken off but should be carried full size for the entire circuit with pipe of ample capacity to serve the total radiation. Shortly after the last branch is served, the main should drop vertically, as at point Y to a point, as at W, such that the pitch from W to Z will be the same as from X to Y (Fig. H-3-1).

Supply branches, as at M, N and O, should be taken from the top of the main or at an angle of 45°, as shown by connection details at the right of Fig. H-3-1. The 45°, branch connection should usually be used for branches near the boiler or for those that supply only upper-floor radiators.

Return branches, as at P, Q and R, should be connected into the side or bottom of the return main, as shown by connection details at right of Fig. H-3-1; the side inlet being used for the less-favored radiator groups, while the 45° downward connections afford a means for slightly checking the flow through certain groups of radiators so as to assure a more uniform circulation throughout the entire system.

Where a branch supplies radiators located on several floors, the upper-floor radiators may be made to augment the circulation to the first-floor radiators by taking the branch for the upper-floor radiators from the side of the branch running to the first-floor radiator, as shown at A, Fig. H-3-2. The first-floor branch should be run full size from B to C in order to favor the lower radiator.

Connections to and from the radiators should be made as shown in Fig. H-3-2. The supply connection is made at the top of the radiator, using a union elbow, and the return at the bottom, using a quick-opening water radiator valve with union connection. Thus only one valve is required to control the radiator.

Since in a one-pipe main, the temperature of the supply water is gradually lowered, as it passes along the main, due principally to the dumping into it of the return water from the radiators along its course, it is advisable to increase the area of the last group of radiators served by 5% to 10% and to increase the size of branch and riser connection at the end of the main by one pipe size.

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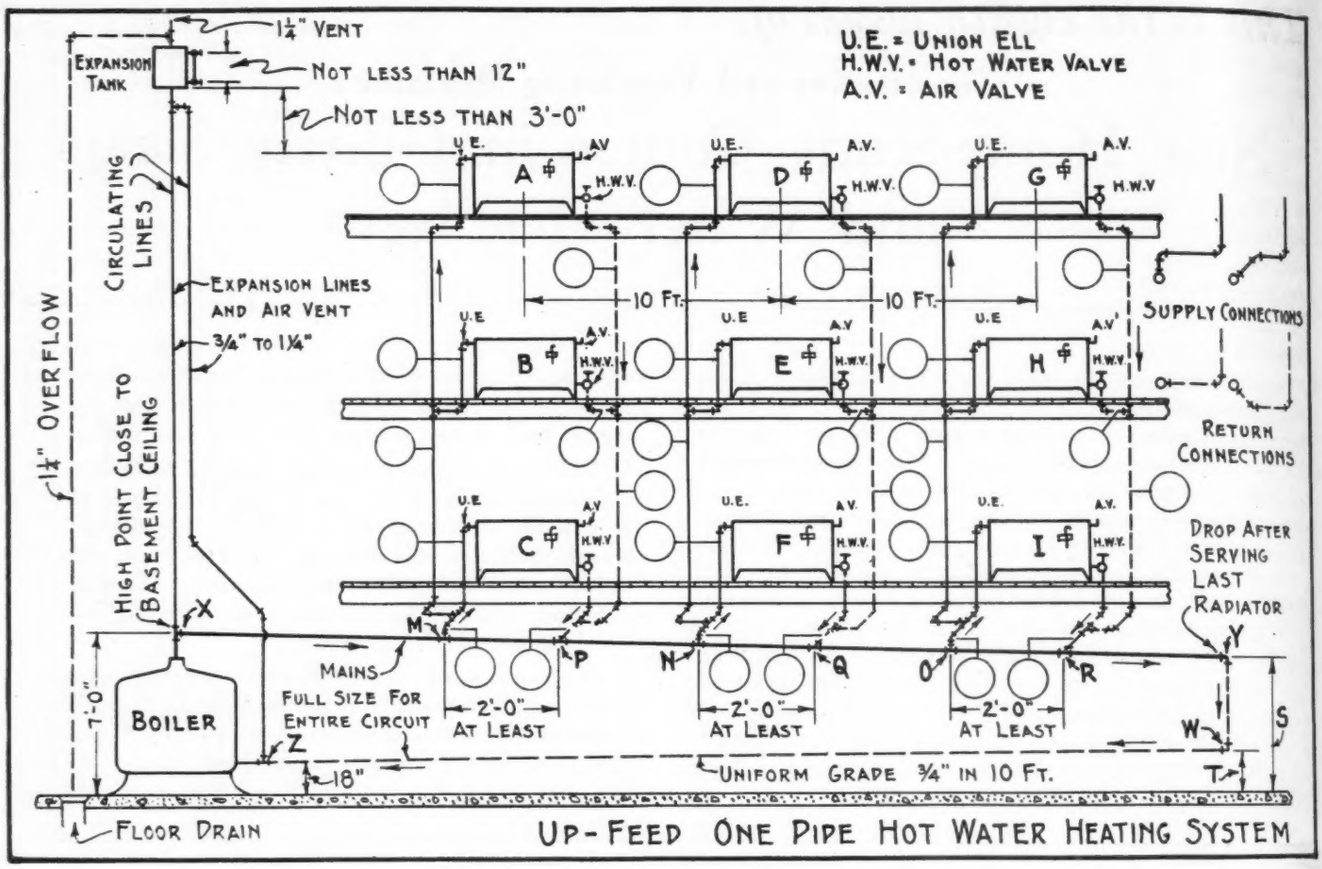


Fig. H-3-1. Typical Up-Feed One-Pipe Water Heating System.

Pipes may be sized and proportioned from Tables H-1-3 and H-1-1 or Table H-1-2.

Work Problems H-3-1, H-3-2, H-3-3

DOWN-FEED WATER HEATING SYSTEM. TWO-PIPE WITH SINGLE RISER

A typical layout for this system is shown in Fig. H-3-3. The supply main is carried to the attic as soon as possible after leaving the boiler through a main riser, as shown at K.

The main riser must be firmly supported in a suitable manner (See Fig. H-3-4). At the high point in the attic, the main should be provided with an enlarged cooling chamber to permit rapid separation of air that collects at the top and removal of it to the expansion tank. This enlarged cooling chamber at the head of the riser is made of a bushed tee having the run twice the diameter of the riser, with the outlet the same size as the attic main.

The attic main is then carried around the building above the radiators, to be fed in a manner similar to that in which the supply main of an up-feed system is carried around the cellar below the radiators.

The main riser can usually be made considerably smaller than the horizontal main in the basement and attic to which it connects since the vertical position of the pipe permits more rapid movement of the water through it. The size of the main riser should be taken from Table H-3-1. The sizes for the horizontal attic run may be taken from Table H-3-2.

A comparison of Tables H-3-1 and H-3-2 will show how much smaller the riser may be, as compared to the horizontal run to which it connects. For instance, if the radiation to be supplied is 900

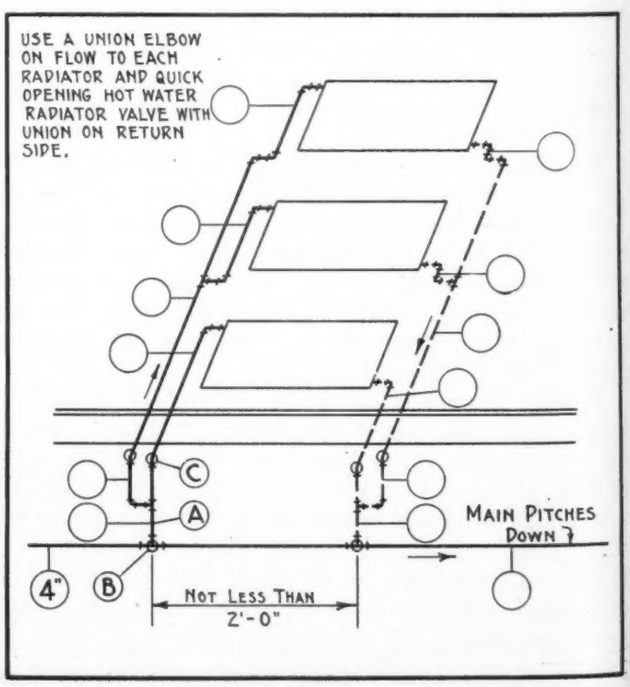

USE A UNION ELBOW ON FLOW TO EACH RADIATOR AND QUICK OPENING HOT WATER RADIATOR VALVE WITH UNION ON RETURN SIDE.
C
A
B
4"
NOT LESS THAN 2'-0"
MAIN PITCHES DOWN

Fig. H-3-2. Typical Radiator Group for Up-Feed One-Pipe System.

sq. ft., by Table H-3-2, the horizontal supply pipe should be 3 in. in diameter whereas by Table H-3-1, the vertical riser need be only 2½-in. pipe.

Work Problem H-3-4

The flow main in the basement from the boiler to the foot of the main vertical riser should grade up from the boiler while in the attic, the flow main should grade down from the enlarged chamber to the end of the run. In each case, the slope should be ¾ in. in 10 ft. or better.

Radiators are supplied through drop risers taken from the side or bottom of the attic main. The use of two elbows affords means for properly grading the branches and providing for expansion therein. The method of connecting a group of radiators is shown in enlarged view in Fig. H-3-5, and sizes for drop risers are to be taken from Table H-3-3, using the column marked "single riser."

Special care should be taken to proportion each section of the riser for the amount of radiating surface that it must serve as both a supply and a return line. Branches from the drop riser to the radiator are also sized by Table H-3-3 and a return from a radiator is made the same size as the supply to it. For radiators having equal areas, but located on different floors, the pipe size is the same.

A study of Fig. H-3-5 shows that, in this down-feed system, water is always circulating through the flow riser, regardless of whether or not any or all the radiators are closed off.

The piping for a group of radiators is proportioned as given below for the group A, B, C, shown in Fig. H-3-5, if they have the following areas.

Radiator.....	A	B	C
Area, sq. ft.....	40	70	60

Total radiation to be supplied=40+70+60=170 sq. ft.

By Table H-3-3, for 170 sq. ft., a 1½-in. pipe is required so (a)=1½ in.

The pipe size to each radiator becomes as follows:

For radiator C....60 sq. ft. (b)=1 in.
For radiator B....70 sq. ft., (c)=1 in.
For radiator A....40 sq. ft., (d)=1 in.

The returns being the same size as supply become:

For radiator C.....(e)=1 in.
For radiator B.....(f)=1 in.
For radiator A.....(g)=1 in.

Section (h) carries water to serve only radiators B and A or 110 sq. ft. A 1¼-in. pipe is required. Section (i) carries the supply for radiators B and A, and also the return water from radiator C. Its capacity must therefore be 170 sq. ft. of radiation, thus requiring a 1½-in. pipe. Section (j) must have a capacity equal to radiators A and C, or 100 sq. ft. which requires a 1¼-in. pipe. Section (k) is similar to section (i) and requires a 1½-in pipe. Section (l) must have a capacity equal to radiators B and C, or 130 sq. ft. which requires a 1½-in.

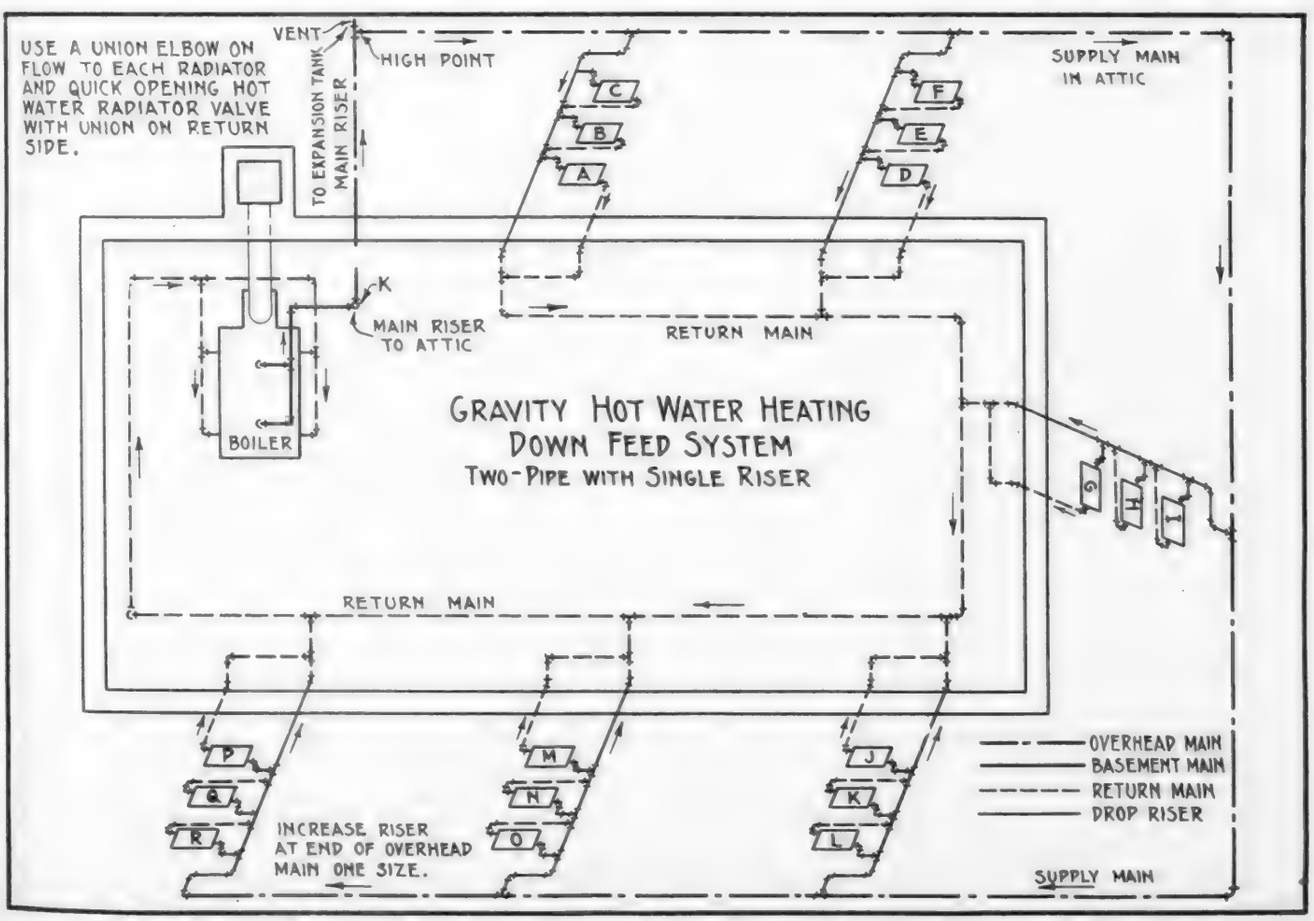


Fig. H-3-3. Typical Basement Plan for a Down-Feed Two-Pipe Water Heating System with Single Riser.

pipe. Section (m) will be made the same size as (g) and section (n) should be the same as (a).

Tabulating the pipe sizes thus determined for the group of radiators in Fig. H-3-5, the following obtains:

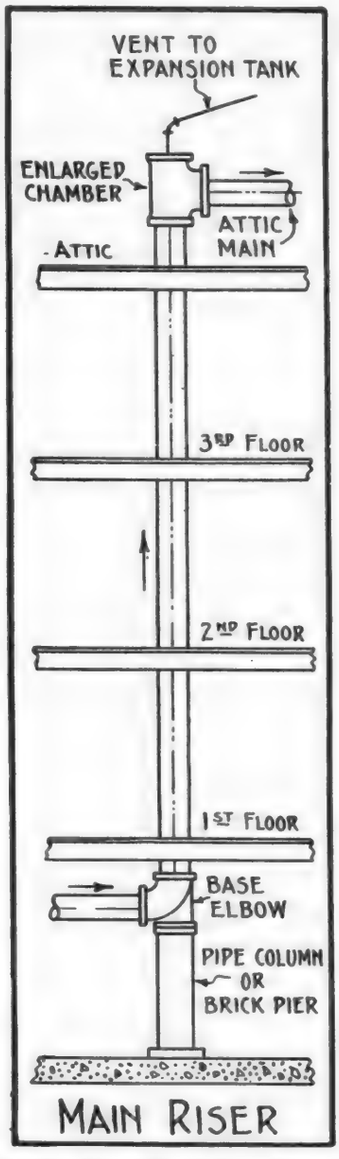


Fig. H-3-4. Main Riser Detail for Typical Down-Feed Water Heating System.

Pipe Section	Size, In. Diam.	Pipe Section	Size In. Diam.
(a)	1½	(h)	1¼
(b)	1	(i)	1½
(c)	1	(j)	1¼
(d)	1	(k)	1½
(e)	1	(l)	1½
(f)	1	(m)	1
(g)	1	(n)	1½

Work Problem H-3-5

If a down-feed system is properly installed, no air valves are required, but special attention should be given the manner in which the radiator branches are connected to the riser so as to assure the escape of any air up the riser and into the overhead main from where it will be vented through the expansion tank. Each radiator should be connected on the flow side with a union elbow, and a quick-opening water radiator valve with union should be used on the radiator return side.

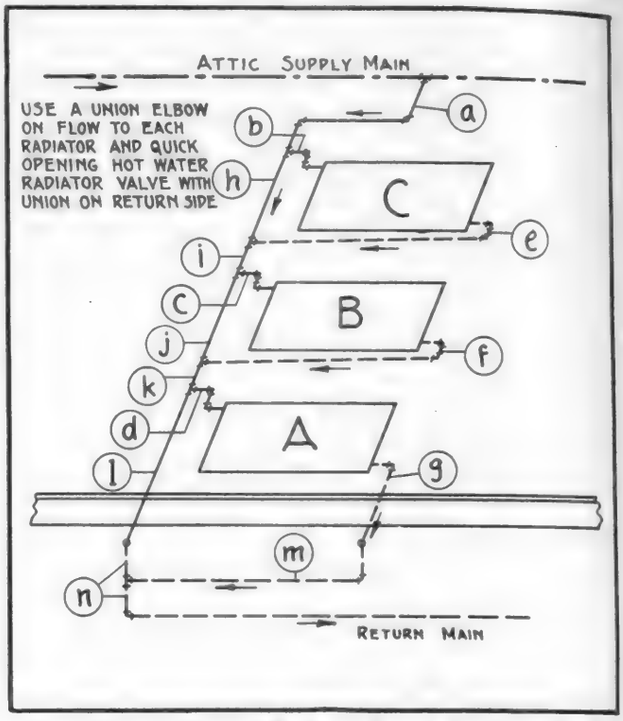


Fig. H-3-5. Typical Radiator Group for Down-Feed Single-Riser Water Heating System.

The size of the supply main in the attic should be reduced as branches are taken off, while the return main in the basement should be increased as the branch returns from the different radiator groups enter it. Pipe sizes should be equalized or proportioned as explained in a previous lesson.

The return main (See Fig. H-3-3) begins under the first radiator served by the overhead main and is run "reversed" so that the water in it flows in the same direction as that in the overhead main. Thus the length of water travel to all radiators is

GRAVITY WATER HEATING - SYSTEM
DOWN FEED OPEN TYPE WITH ATTIC MAIN
PIPE SIZES IN TERMS OF RADIATION

TABLE H-3-1

MAIN RISER	
PIPE SIZE	RADIATION SQ. FT.
1¼	200
1½	350
2	600
2½	1200
3	2000
3½	2500
4	3500
4½	4500
5	6000
6	10000
7	12000
8	15000
NOTE:- SEE FIG. H-3-4.	

TABLE H-3-2

MAINS 100' LONG	
PIPE SIZE	RADIATION SQ. FT.
1¼	150
1½	250
2	350
2½	540
3	900
3½	1300
4	1800
4½	2400
5	3200
6	5000
7	7200
8	10000
10	13000
12	16000

TABLE H-3-3

DROP RISERS		
PIPE SIZE	RADIATION-SQ.FT.	
	SINGLE RISER	DOUBLE RISER
¾	25	50
1	80	120
1¼	120	200
1½	200	350
2	400	600
2½	750	1200
3	1000	2000
NOTE:- RADIATOR TAPPINGS SAME AS PIPE SIZE AND FOR SAME SIZE RADIATOR PIPE SIZE IS THE SAME FOR ANY FLOOR. INCREASE RISER ONE SIZE AT END OF OVERHEAD MAIN.		

MAIN AND DROP RISER TABLES BY C. B. THOMPSON. HARDING & WILLARD

equalized and consequently equal resistance to flow is obtained as explained in a previous lesson.

Work Problem H-3-6

In what has preceded relating to the design and installation of water heating systems, the student has been instructed to use certain tables for determining and specifying sizes for horizontal mains, risers, branches and radiator connections. It is important that the student be duly impressed with the fact that no hard and fast rules that apply to every case can be laid down. In order to design and install a hot water gravity circulating system in which the circulation will assure practically even warming-up of the radiators, all conditions of the particular installation must be considered.

For the sake of uniformity and on account of the impossibility of giving all the details that would exist for different jobs, the student should always endeavor to follow instructions that accompany the statements of the assigned problems as to tables or methods that should be used, as well as the many special instructions given.

Every hot water design should be tackled in a systematic manner. When a student has completed this course and is preparing original designs in practice, he may adopt a system that better suits his needs. However, it is believed that the best results will be obtained by observing, in general, the following.

First: Consider the size of the radiator, its location and the cooling effect upon the water within it, in deciding upon the size of connections. A consideration of its location is necessary in order to determine the relation of friction to flow of water to it, compared to the flow to other radiators.

Second: After all branch connections have been sized, proceed to size all branches that supply more than one radiator by making the pipe or pipes equal to or greater in area than the area of the radiator connections from the pipe supplying them.

Third: After all such pipes (under SECOND) have been sized, proceed to size the different parts of the main so that its area at any point is equal to or greater than the area of all pipes supplied past that point.

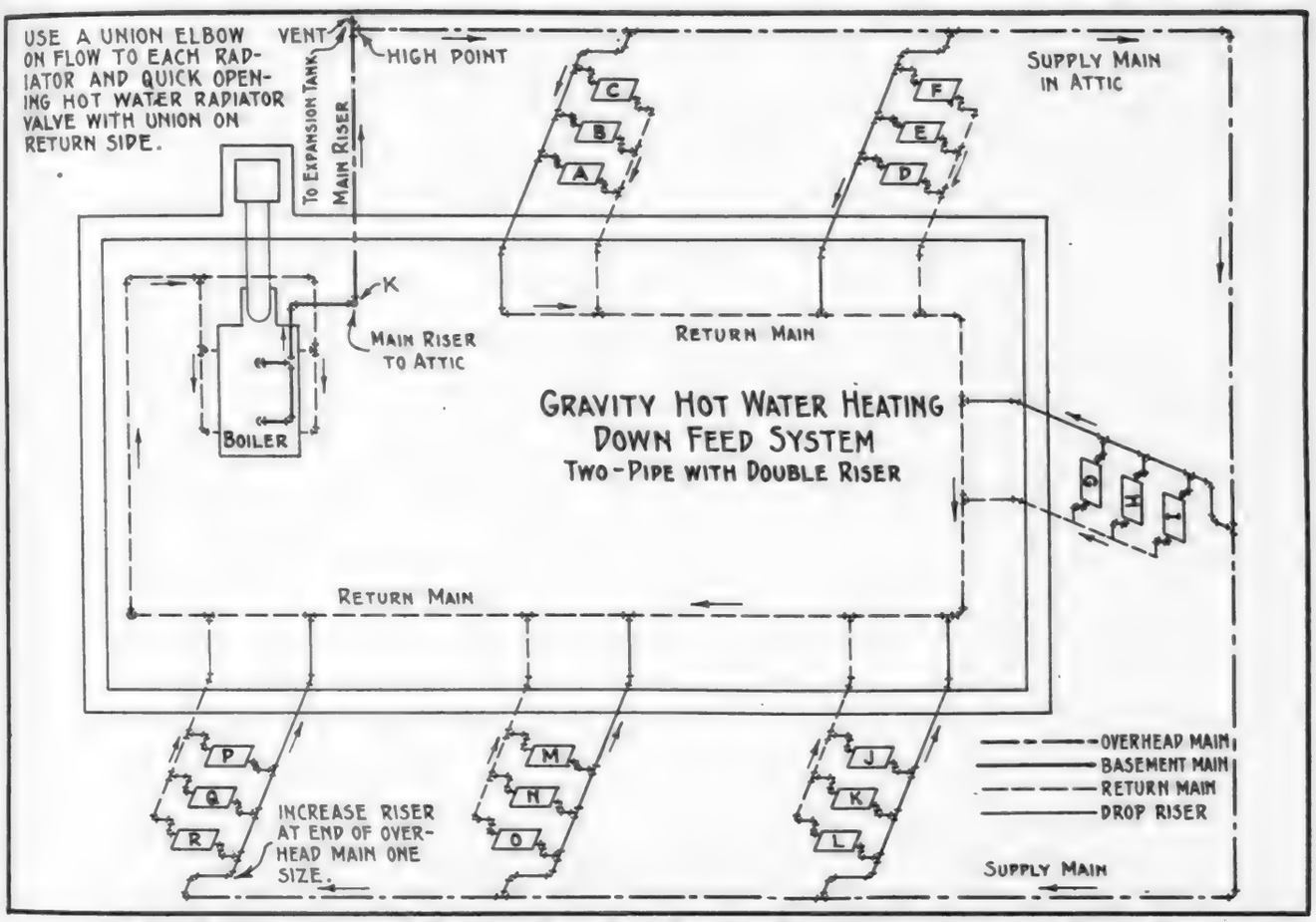


Fig. H-3-6. Typical Basement Plan for a Down-Feed Two-Pipe Water Heating System with Double Riser.

If a design is based entirely and only on radiating surface, there is likelihood of having a short circuit in the system by having one or more groups of radiators near the boiler containing slightly less radiation than that required for a size larger pipe and the radiators near the end containing a small amount of radiation for their pipe size. The main designed on the basis of radiating surface would be large near the boiler and small near the far end. It is possible that the area of the main toward the far end would be much smaller than the area of the branches. This condition would most likely cause a short circuit of the water through the radiators near the boiler and either fail to reach

the far end radiators or be so slow in reaching them that the radiators could give no useful service.

Work Problem H-3-7

DOWN-FEED WATER HEATING SYSTEM. TWO-PIPE WITH DOUBLE RISER

A typical down-feed, two-pipe, with double riser, water heating system is shown in Fig. H-3-6. This system is much like the system with single riser as

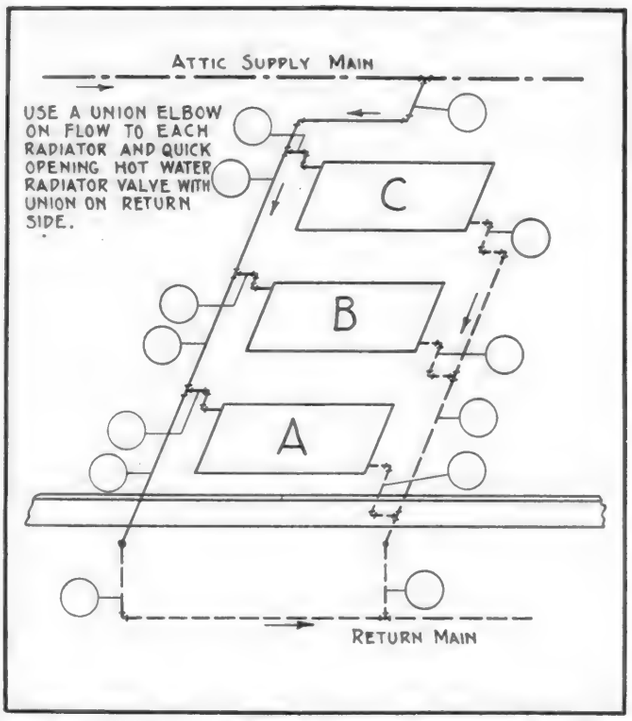

ATTIC SUPPLY MAIN
USE A UNION ELBOW ON FLOW TO EACH RADIATOR AND QUICK OPENING HOT WATER RADIATOR VALVE WITH UNION ON RETURN SIDE.
C
B
A
RETURN MAIN

Fig. H-3-7. Typical Radiator Group for Down-Feed Two-Pipe Double-Riser Water Heating System.

shown in Fig. H-3-3. It will be noted that there are two drop risers, one for the supply and one for the return.

A group of radiators piped for this system is shown in Fig. H-3-7. Double-riser piping permits of somewhat smaller pipe size. This is apparent from a study of the second and third columns of Table H-3-3. For instance, a ¾-in. pipe will supply 50 sq. ft. of direct radiation when used as a double riser whereas this amount of radiation with a single riser should have a 1-in. pipe. The last column of Table H-3-3 should therefore be used for proportioning pipes for the down-feed two-pipe, with double-riser system.

The main riser is installed as shown in Fig. H-3-4, the horizontal main is carried around the basement in a similar manner to that shown in Fig. H-3-3 and the return should be run "reversed."

The determination of pipe sizes for a radiator group is done similarly as explained above for the group shown in Fig. H-3-5.

Work Problems H-3-8, H-3-9, H-3-10

The fourth lesson of the water heating section (Lesson 9) to appear next month, will include further application of the down-feed system and the use thereof for one and two-story installations without basement.

What Happens When We Burn Oil

(*Continued from page* 56)

We have decided how much heat we wish to produce in a given time. We therefore know the amount of liquid fuel to be fed. From this we know the amount of air necessary for complete combustion.

IMPORTANCE OF SHAPE OF FLAME

We must decide on the amount of space available for this combustion, and from this we can calculate the velocity at which the air is to be delivered. If we wish to make use of the radiant heat of the flame, as, for instance, in stoves and warm-air furnaces, the shape of the flame is of prime importance, as the radiant heat which amounts to about 30% is emitted from the surface of the flame and in a direction normal to the surface. Therefore if we have a cylindrical surface to heat, we should produce a cylindrically-shaped flame surface, the shape of a flame being determined by the shape of the outside surface of the oil gas produced. This shape may be controlled by the direction and velocity of the liquid oil, as well as by the direction and velocity of the impinging air. In fact, the resultant of these two velocities is the final shape. As all the mixing of the oxygen and hydro-carbon must be made along the surface between the air and the outer surface of the oil gas, it is essential that we provide means for as large a surface as possible, and further means for keeping the oil gas up to the ignition point until the reaction between the hydro-carbon and oxygen is completed. Various means will at once be apparent, such as using a fire-brick target, or bringing the tail of the flame around to the initial ignition point, thus using the heat from the hydrogen a second time, or by setting up eddy currents with the forced air. Noise will occur wherever air is admitted at a velocity greater than the rate of the flame propagation for the particular mixture and temperature. Smoke will occur wherever the incandescent carbon is allowed to cool down below the ignition point, either from the admitting of too much air, which will chill the carbon, or insufficient air, which allows the carbon to travel too far before meeting its oxygen affinity.

We have on our hands for the next ten years, competition with the gas-man and then with the electric light companies. The only oil-burner which will be capable of standing up against these two competitors, will be far different from your present conception of a burner, and will, in fact, be nothing more than a method of combustion, and will be an inherent part of the heat absorbing medium. The two competitors, gas and electricity, should not be taken lightly, and only by knowing our subject better than they know theirs, can we provide a type of heat, which will be more than their equal in results obtained, and far below them in cost of operation.

Progress of House Heating by Gas in Chicago

By Glenn C. Carnahan

Superintendent House and Water Heating Department, The Peoples Gas Light and Coke Company, Chicago, Ill.

1. Can House Heating by Gas be Developed into a Big Business?

(Presented at the Twentieth Annual Convention Iowa District Gas Association Cedar Rapids, Ia., April 22-24, 1925.)

THE first heating plants in Chicago designed for gas were installed in 1916. Previous to that time the homes which were gas heated had burners in coal boilers or furnaces which were relics of the natural-gas days. Much commercial heating was done at that time and this has been increased by means of Gasteam radiators in stores, loft buildings, etc., but most of the gas-fired central plants in homes have been installed within the last two years, during which time a special gas rate has been in effect for this class of business. Of this class of installations we have just passed the 500 mark in number. Accordingly, the heating season of 1923-1924, and the present one were the only two seasons during which enough plants were operating to actually indicate what the future might bring when this branch of our business becomes more general.

We are now at the point where we must answer the question, can we actually sell thousands of such installations during the next few years? In answering this question at this time without taking into consideration any changes in comparative rates or any of the distribution problems, and only attacking the question from the angle of public reaction and demand, I think there is no doubt that the public can be induced to buy gas-heating plants quite freely. This seems quite certain, provided we can do as we claim, which is to make gas as a fuel for central heating plants the best that can be had from the consumer's standpoint. It is absolutely essential to the success of gas as a home-heating fuel that this be true because for some years to come gas will cost more than either coal or oil, when used for heating homes.

Therefore, if we are to ask our customers to pay more for heating their homes when using gas, we must see that they get quality and service, convenience, degree of cleanliness, additional comfort and added satisfaction which in the aggregate will offset the additional cost. In some small measure we are already getting an indication of this composite result from our present users. If the service is what they expected they pay for it without grumbling over the cost.

Therefore, the answer to the question, can we sell gas in large volume for house-heating brings home to ourselves another question, which is, can we make gas-fired central heating plants the best obtainable? In other words, can we make our gas service worth the price? The answer lies with the individual company which undertakes the sale of gas for heating homes.

Up to this time we have not been in a position to interest many whose finances and mode of living call for a chauffeur, gardener and houseman. We have very little to offer this class, as the advantages offered by gas heating are generally voided by the class of his present service. On the other hand, we cannot hope to sell gas heating to those who by reason of the size of their incomes, find it necessary to take care of their own furnace fires so that they may be in a position to meet their other obligations, which well might include payments on their home. There are plenty of people in every locality who are not necessarily wealthy, but who can well afford to hire janitor service, and in most cases do or would if the service obtainable were satisfactory. These people are the ones whom we have been able to interest and sell. Indications are that they are the ones to whom we have the most to offer. If this is true, we have an almost limitless field to which gas for heating may be sold.

Our chief problem at present is to acquaint the public with the fact that house-heating with gas is the logical method, and to convince those who hear or read our message that heating with gas is practical both from the standpoint of cost and from the standpoint of actually keeping homes comfortable in zero weather. Our commercial heating has been a big help to us in this direction. Business men who have used gas to heat their place of business can easily see its application to the same use in their home.

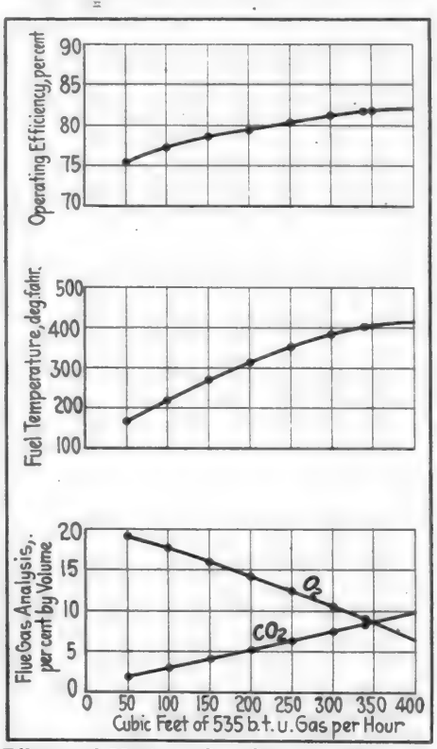
To answer the inquiry created, we have a special force of men who sell nothing else but house-heating appliances. Here again, the real problem is to get the type of men who have the training, or who will acquire the knowledge of an expert heating engineer, and still be a salesman of such calibre as required for selling this comparatively high-priced service and equipment. Such men must have vision and be able not only to see a future day when the smoke nuisances of the present are

abated, but to make the customer feel that he is willing to pay for the best in the way of home-heating appliances and fuel.

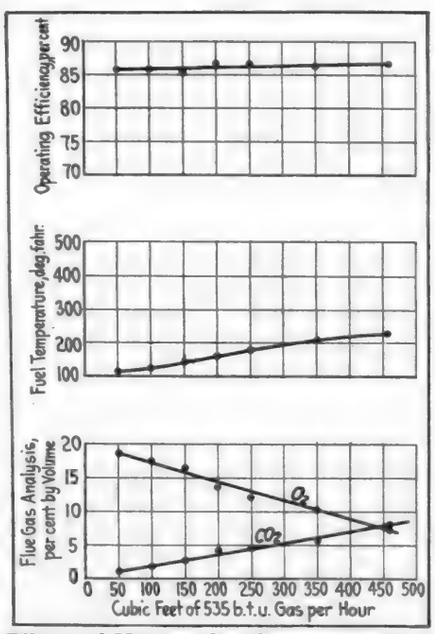
Pride in home life is what prompts the American home owner to buy for his home those luxuries. Among these gas-heating is at present one and in which price is not the controlling factor. Salesmen so employed must have the right viewpoint. It goes without saying that they themselves must believe in gas-heating. Viewpoint and belief are built up by constant contact and a thorough knowledge of the advantages, as well as the problems which are to be met and solved. Our experience, even though short, seems to indicate that these men must deal exclusively with house-heating. They must be able to speak of $500 or $600 for equipment without having a tremor to their voice. When men sell merchandise involving small as well as large amounts, either they hold the small sales in more or less contempt or are in awe of the large transactions. Any company owes it to their customers to give the most accurate information possible and especially in a new venture. This kind of information is only possible from men who devote their entire time and energies to one subject.

New buildings are promising prospects for gas-fired central house-heating. Very little extra expense is involved to install gas-equipment instead of coal, therefore, the one obstacle of the cost for new equipment is not encountered. Architects and builders must be acquainted and sold on gas for heat. Our best approach has been through the owner. Selling him with the proposition first has given us suitable entry to many architects who otherwise showed no interest.

Heating contractors and furnace men have been a big factor in helping us to sell gas-heating equipment. Many have become acquainted with our product by installing boilers and furnaces which were specified for new buildings. This equipment is bought from us in the same manner that other supplies are purchased from a supply house. By meeting them when installations are made we form an acquaintance and are in a position to tell our story without seeming to solicit them. Many steam-fitters have begun to sell gas boilers of their own accord, buying the equipment from us and dealing independently with their customers. One big factor has brought this about. Many were selling oil burners and they found that they had to service these themselves which soon used up their profit. With gas equipment we assumed the serving.



Effects of Various Gas Consumptions on a Gas-Fired Warm Air Furnace



Effects of Various Gas Consumptions on Gas-Fired Water Boiler

COST OF INSTALLATION

Two questions present themselves to the home owner whom we have, by various means, caused to consider heating his home with gas. First, what does it cost to install equipment? And second, what will it cost to operate?

In considering the first we are at once confronted with the question of gas-designed equipment versus conversion. We have done no conversion work in Chicago as we have operated on the theory that if a customer cannot afford to make the necessary outlay for the proper equipment to burn gas most efficiently, he cannot afford to pay the penalty which will be imposed on him in the form of increased cost of operating with gas burners in a coal boiler. We have been emphatic and firm on this point.

Our stand on this matter seems to be justified by the experience in Denver, Colorado. They are now changing some of their conversion jobs to equipment designed for gas. By so doing it has been found that a customer can save from 25% to 33% in operation cost. This means that conversions were imposing operating penalties of 33% to 50% over the cost with proper gas equipment.

On this basis assuming a conversion cost of $200 and a straight gas-designed installation cost of $600, and that with a gas boiler or gas furnace the operating cost would be $400 per season, then a burner installation would cost $130 to $200 more per season to operate and in two to four years use the owners would pay the difference between a conversion job and equipment designed for gas by the increased cost of operating.

In addition to this, many warm-air furnaces are in need of repairs or replacement anyway, while some steam and water boilers are too small to give sufficient heat with coal. This fact has caused the owner to look to another fuel for relief, but equipping such installations with gas burners would be suicide. While our stand on conversions no doubt has lost us some business for the present, we firmly

believe we shall be ahead of the game in a few years by maintaining this policy. Accordingly we ask the customer to put in a new furnace or boiler as the case may be.

Most all furnaces are straight replacements. While it is possible to cross-connect a gas and coal furnace, this is not especially desirable because of the space they take up in the basement. Hot water, steam and vapor boilers are invariably cross-connected unless the coal boiler is completely useless.

In all cases we install thermostatic room-temperature controls as a part of the equipment for homes. Occasionally we install a warm-air furnace in a store where manual control is employed. In the majority of installations of both the boilers and furnaces the thermostat turns on and off the full supply of gas. This seems to be the most economical plan of operation. However, with warm-air furnaces better satisfaction is occasionally experienced by the user if about half the gas is turned off in mild weather. This allows heat to be emitted from the registers more of the time. The full number of burners are turned on only when weather conditions demand the full capacity of the furnace.

With steam or vapor boilers we commonly leave the full supply of gas available at all times to be turned on and off by either pressure or thermostatic control. Occasionally we turn out end burners if the boiler generates steam faster than the radiation will condense it, and the frequent flashing of burners is annoying to customers.

Our experience with water boilers has led us to adopt water-temperature control in addition to room-temperature control. In some cases pilot burners are used, in addition to pilot lights, because of what might be termed a saw-tooth effect in room temperature. This effect is caused by the fact that a water system stores more heat than either steam or warm-air systems. It takes a longer time to bring the building up to temperature, and when the room regulator turns the gas off the hot water in the system will invariably carry the room-temperature beyond the point desired. During average weather the water will get cold and when the thermostat again turns the gas on, the house continues to cool below the required temperature before the water is heated enough to check the fall in temperature.

A pilot burner in addition to pilot lights, keeps the water in the system at a more uniform temperature, and corrects this fluctuation in room-temperature, also causes a gas-fired hot water system to operate more to the users comfort and satisfaction. It is advisable, however, to turn the pilot burner out at night, as well as during mild weather. The pilot burners add slightly to the cost of operation, but such additional cost is often justified by the results obtained on hot water installations.

All installations are made by regular heating contractors. We have adopted this policy because of two main ideas: First, with the object of securing their good will and eventual assistance in selling gas-heating; second, to take advantage of the knowledge and experience of those who have long been associated with the heating business, and whose knowledge is based on experience. This policy has seemed to be justified as many sales are now made by heating contractors. The assistance of competent heating engineers has also prevented many errors in installations which we would have made had we attempted the installing by our own mechanics. One of the most common faults found in warm-air furnace installations is the lack in area of the cold air ducts. At present, in all our installations of warm-air heating, we employ recirculation of the air entirely. When outside cold air connections are found they are cut off. The return air ducts are always installed so that their area is equal to the combined area of the warm-air ducts.

Automatic humidifiers are employed and the effect of the increased humidity has a very marked effect on the comfort and satisfaction of a gas-fired warm-air installation.

The next section of Mr. Carnahan's article will take up the matter of what it costs to heat with gas. In this connection examples will be given of gas consumption in 48 typical homes in Chicago.

Back to First Principles

By T. W. Reynolds

(Continued from the April issue)

As check valves have been shown to be objectionable in certain respects, it is desirable to use some other method of preventing the water from backing out of the boiler. There is such a method which not only accomplishes the purpose in mind without the use of check valves, but which has also the advantage that if the stop valve is closed while the pressure is on the boiler, the boiler would still be connected to the system so as to relieve the pressure through the return header. Another feature is that under such conditions attention would no doubt be directed to the boiler because of the resulting water hammer produced in the return piping.

In general the connections are made as shown in Fig. 57,—for wet returns the return entering at "A," or if the return is dry, the piping is extended up to "B," as shown dotted. The water seal formed

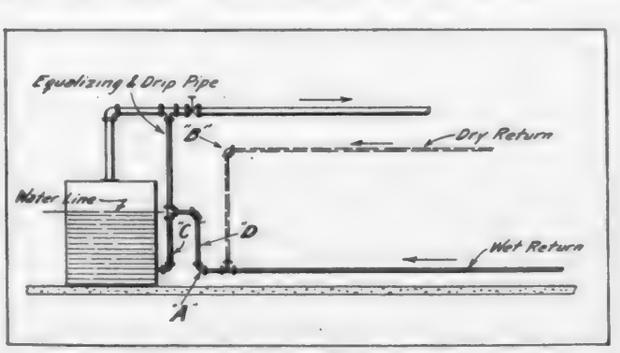


Fig. 57. Sketch Showing How The Need For Check Valves At Boilers May Be Eliminated By Water-Sealing The Returns

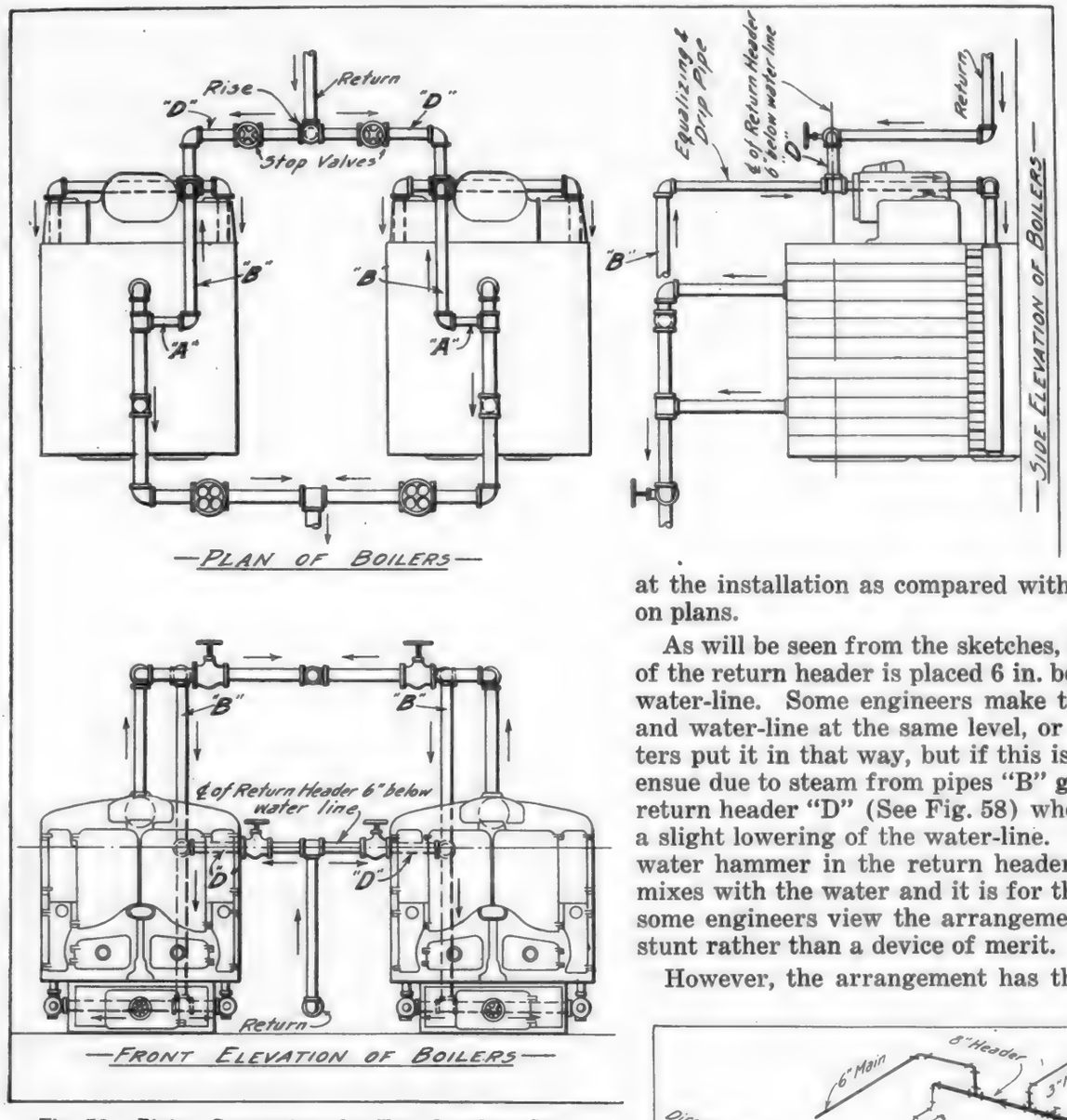


Fig. 58. Piping Connections for Two Cast-Iron Sectional Boilers

by pipe "C" prevents the water from leaving the boiler through the return. Pressures within the boiler and in pipe at "C" are balanced or equalized. As the pressure decreases in the far end of the system, water in pipe "D" will be forced down, then up towards "B," enough to balance the difference in pressure.

This arrangement is shown in more detail in Figs. 58-59-60 for two cast-iron heaters, one cast-iron heater, and two steel boilers, respectively, the last two being sketches prepared from recent installations in the State of New Jersey. This method of connecting the returns has been used by many engineers in recent times, though objected to by some because of the human element; in other words, the pipe fitter who does not always make the proper connections.

There are, of course, extenuating circumstances, —pipes as actually put in must accommodate themselves to structural conditions, their arrangement and purpose are not as simple and direct viewed at the installation as compared with the diagrams on plans.

As will be seen from the sketches, the center line of the return header is placed 6 in. below the boiler water-line. Some engineers make this center-line and water-line at the same level, or some pipe fitters put it in that way, but if this is done troubles ensue due to steam from pipes "B" getting into the return header "D" (See Fig. 58) whenever there is a slight lowering of the water-line. This produces water hammer in the return header as the steam mixes with the water and it is for this reason that some engineers view the arrangement as a piping stunt rather than a device of merit.

However, the arrangement has the approval of

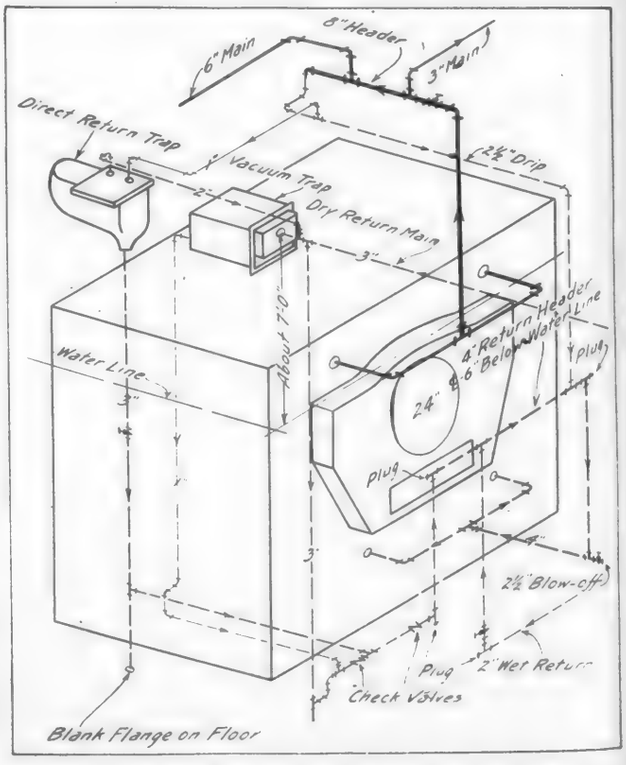


Fig. 59. Method of Connecting Piping For Single Cast-Iron Sectional Boiler

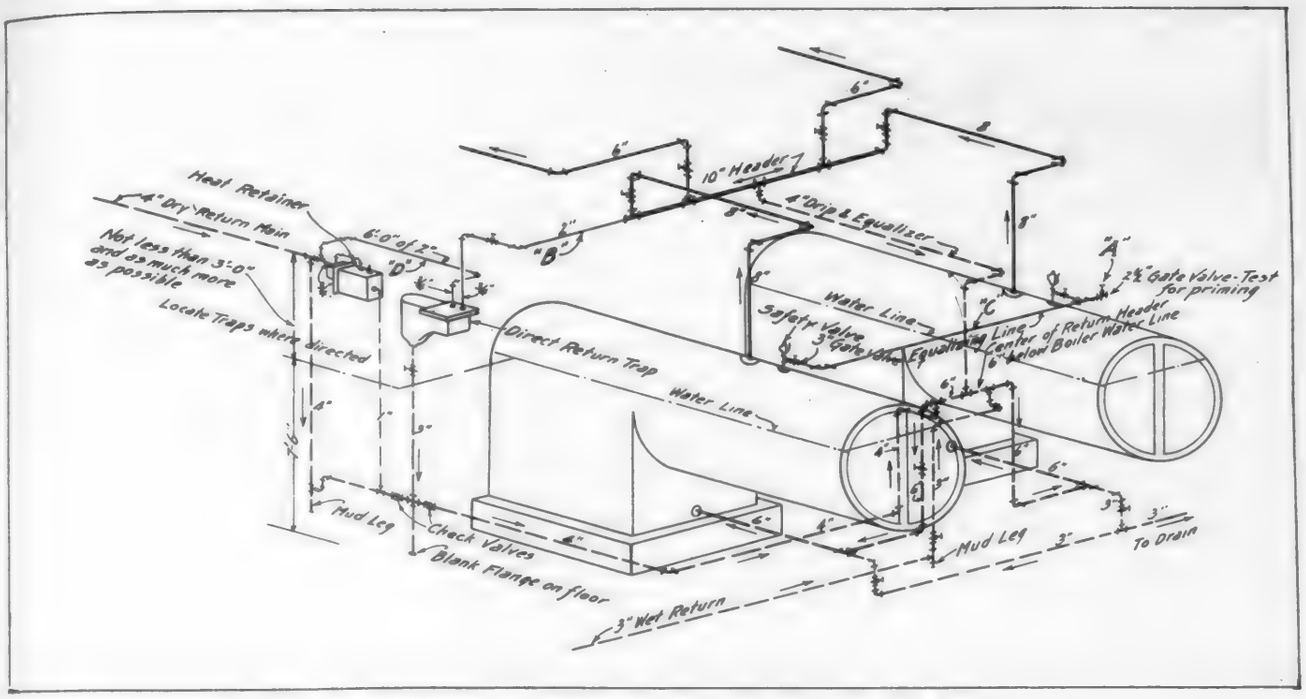


Fig. 60. Arrangement of Connections For Two Steel Heating Boilers

steam boiler insurance companies and was adopted by these organizations as the outgrowth of experiments made by the National Boiler and Radiator Manufacturers Association and the Steam Boiler and Fly Wheel Service Bureau at the Westfield, Mass. plant of the H. B. Smith Co. (See report of tests in Jour. A. S. H. & V. Engrs. May 1920-April 1922.)

Referring to Fig. 58, steam connections "A" should be taken off between stop valves (if any) and boiler, also steam pipes "B" should be as short as practicable and should be run with a minimum of turns. Pipe sizes for the latter should not be smaller than 1½ in., 2½ in., and 4 in. for grate areas of 4, 4 to 15, and 15 sq. ft. or more, respectively.

It is very important that these directions be carefully observed so that the friction to flow of steam will be the same from each boiler, thus equalizing the pressures throughout steam and return headers. The larger these headers the better will be the equalization, in fact the more they are designed to give ample area as in the old fashioned steam dome, the drier the steam will be. If there is more than one steam outlet on the boiler they should be both connected to the steam header and so by this means prevent the steam otherwise leaving the boiler all at one point from lifting the water to the header, due to its higher velocity. Return headers should be made half the size of the steam header, except that no return header should be made less than 3 in. in size. Use steam headers of 4 in., 6 in., 8 in., 10 in. and 12 in. size for radiation supplied of 4000, 7000, 15000, 25000, and 45000 sq. ft., respectively.

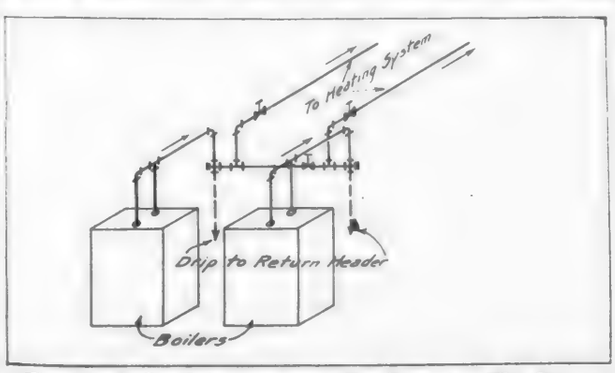


Fig. 61. A Good Arrangement For Dripping The Steam Header Of Two Boilers.

An additional means for the equalization of pressures and a very good one is shown in Fig. 60, a pipe connecting to just below the two safety valves, as shown. If the rate of evaporation in one boiler is higher than another the excess pressure produced will communicate itself through this true equalizing pipe to the other boiler and the safety valve on one boiler is not apt to pop before the other.

Referring again to Fig. 58, a better method of dripping would be to take steam connections "A" from the bottom of the steam leads, instead of from their sides, but the best method of all is to arrange the drips as shown in Fig. 61, rather than as shown in either Figs. 58 or 60.

Commenting further on Fig. 60, the size of the drip pipe is usually made one pipe size less than half that of the steam header. The pipe at "B" should be of liberal size in order to communicate true boiler pressure to the return trap and return the water to the boiler. Valve at "A" is used for testing to see if the boilers are priming, though the safety valves can be used for this purpose if desired in order to save the cost of the additional valve, in which case only one valve is required in equalizing line "C", instead of three valves. The pipe at "D" is merely an air vent from the trap. Check valves shown below the trap are necessary in vapor systems.

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OUT of the welter of conflicting ideas regarding the ventilation of buildings, the issue is being gradually narrowed down to two general schools of thought. On one hand we have the "ultra-modernist" group, made up largely of medical men, sanitarians and health officials, whose attitude may be summed up in the statement:

> "Existing ventilation legislation wastes $2,500,000 annually of taxpayers' money in the United States and is not only needlessly extravagant but actually injurious to the health of school children. . . . Ideal room ventilation is not obtained by pouring in a volume of warm air, but by providing a small amount of cool, fresh air to counterbalance the occurrence of a warm, moist and still atmospheric condition. With an air supply of 30 cu. ft. per minute, it is essential to maintain temperatures generally over 68° F. to avoid unpleasant drafts. Such a warm atmosphere causes a rise in body temperature, an increased pulse rate, respiration and decreased blood pressure, and results in markedly diminishing one's working efficiency and in seriously increasing one's susceptibility to respiratory diseases.—DR. C.-E. A. WINSLOW.

This, we think, fairly expresses the "ultra-modern" view. On the other hand, we have, in the following expressions, the calm and well-considered judgment of practical men in the industry, formed in the light of all the recent discussions of the subject.

> "Air motion over the individual plays a most important part in the satisfaction obtained; but how are you going to get air motion over the entire area of a school room unless a sufficiently large volume of air is delivered to accomplish it? It can't be done with 5 cu. ft. per minute; and we haven't learned how to do it with less than 20 cu. ft. per minute per person, and about the least that should be attempted in school buildings is 30 cu. ft.
>
> "Raising the relative humidity to about twice what is normally found in the average school in cold weather will permit the dry-bulb temperature to be lowered from 4° to 6°, as compared with the usual school temperature. If, in addition, the air is so distributed that an air motion of from 50 to 100 ft. per minute prevails all over the room, and all odors are eliminated, then an approximation of the same exhiliration will be obtained indoors as is felt outdoors in the finest weather. This can and is being done today.
>
> "We are satisfied that 5 cu. ft. of outdoor air, mixed with 25 cu. ft. of recirculated air, all of which is passed through a properly-designed air washer, will give as highly satisfactory results as anyone could desire, and thereby save from 40% to 60% of the heat usually used by any system of ventilation anybody can name.—F. R. STILL.

And again:

> "The most satisfactory and most economical heating and ventilating system for a school building is a low-pressure steam boiler for heat and power and a compact fan and heating coils in which the fully washed and ozonized air is passed through the class-rooms and returned by way of the attic back to the fan for repurification. The supply of new fresh air should be warmed in a jacketed smoke stack so that the large fresh-air intake may be kept wide open at all times. The volume of air supplied to class-rooms must be large enough to be perceptible as air motion yet not a draft and be adjustable at the diffuser. . . . It is a most absurd law that compels a certain fan capacity to be installed in a school and permits the use of radiators which in practice will entirely nullify the law as to ventilation. The split system is an antiquated thing that must be relegated to the scrap heap, along with the massive vent stacks and gravity indirects and aspirating coils.—EDWIN S. HALLETT.

Assuming the expressions here quoted correctly reflect the views of the two opposing groups, the heating and ventilating industry, we are sure, will be quite content to see the issue joined on this basis in a fight to the finish, confident that the ultimate outcome will be the vindication of mechanical ventilation.

Stabilized Conditions Reported in District Heating Field

Possibility of Lower Fuel Costs, Due to Improved Labor-Saving, Coal-Mining Machinery, Bright Spot at Association's Annual Convention

IMPROVED conditions in the district heating field and some interesting possibilities of the early future were reported at the sixteenth annual convention of the National District Heating Association, held at West Baden Springs, Ind., May 19-22. Adequate rates, it was felt, have now been established in most localities, enabling the utility companies to operate with a reasonable degree of profit. One of the interesting possibilities referred to was in connection with the introduction of improved labor-saving machinery in the mining of coal which would have the effect of lowering fuel costs to a marked extent. How soon this development will become a reality, it was stated, depends upon the union miners who at present are maintaining an attitude of determined opposition to the use of these new appliances.

One of the keynotes of the meeting was the emphasis placed upon increased efficiency of the heating plant and, to no less a degree, upon the need of helping the consumer to reduce his heating costs.

As one speaker expressed it, there is something incongruous in adopting every available means for eliminating line losses only to have the heat wasted when it reaches the consumer's premises. While the heating companies, it was shown, are in business to sell the greatest possible amount of heat, they are thoroughly awake now to the importance of educating the consumer in the economical operation of his heating system. The effect of this policy in promoting good-will, and in actually increasing heating sales, was brought out very clearly, and is one of the things that is going far to popularize district heating.

A novel suggestion made during the convention, which found a hearty response on the part of all present, was a proposal to construct a moving picture film on the subject of "How to Save Heat in the Home," with special emphasis on the use of insulating building materials and weather stripping and on practical measures for reducing the steam consumption in the system itself.

Tuesday Morning Session, May 19.

President O. W. Kastens called the convention to order Tuesday morning in the convention hall of the West Baden Springs Hotel. In his opening address he declared that the time had come to look upon the commercial side of district heating, and he advocated a national advertising campaign to cash in on the technical data which have been accumulated by the association. The cities, he said, are enacting more stringent smoke ordinances and this movement, with the increased value of building space, is operating to the advantage of central station heating service. The association, he declared, has an important duty to perform in bringing district heating to the attention of cities and towns which are not yet enjoying its benefits. He advocated combined heating and electric plants in cities, in preference to the installation of high-pressure steam transmission lines.

Earle Shultz
President of the National District Heating Association.

Mr. Schultz is vice-president and manager of the Illinois Maintenance Company of Chicago and is a former president of the National Association of Building Owners and Managers. He is a graduate of Ottawa University, Ottawa, Kansas. His early career was connected with the management of office buildings in Chicago; he was for several years assistant manager of the First National Bank Building and, later, manager of the Edison Building, both in Chicago. Mr. Shultz was appointed to his present position with the Illinois Maintenance Company in 1918.

President Kastens proposed the adoption of a "demand" rate or "load factor" rate as a basis for charging for heating service in place of the present "required radiation" rate.

Secretary-Treasurer D. L. Gaskill reported the finances of the association to be in satisfactory shape. While the balance on hand at the end of the year is smaller than last year, the outstanding accounts of the association have been correspondingly reduced. The receipts for the year were $10,596, and the expenditures $10,559.

The membership of the association, he reported, is now comprised of: honorary members 2, Class A 110, Class B 99, Class C 33, Class D5, associates 33, making a total of 282.

Technical Secretary H. R. Wetherell reported that while no new sheets had been added to the association's Handbook, plans were going forward to publish a new edition in 1927, and he proposed the appointment of a committee to assist him in revising the sheets already published, as well as in compiling new sheets. A motion to this effect was passed, this committee to consist of five members with Mr. Wetherell as chairman.

The Executive Committee's report reviewed the routine work of the society during the year. President Kastens then appointed as the new Nominating Committee, J. H. Walker, chairman, George W. Martin and Davis S. Boyden.

REPORT OF EDUCATION COMMITTEE

For the Education Committee, Chairman J. H. Walker discussed the Handbook at length. The principal need at present, he said, is to make the Handbook more comprehensive as data on some important subjects are still lacking. He endorsed the plan for an entire revision of the Handbook and this, he said, would be the committee's principal work during the coming year.

For the Corrosion Committee, Mr. Walker, who is also chairman of that committee, told of corrosion tests conducted during the past winter in several buildings having different types of

heating systems. The tests were conducted by exposing some carefully-weighed samples of metal to the action of the steam and condensation at both the inlet and discharge points of the heating systems. The specimens used were cast-iron, wrought-iron and steel.

Many of the specimens were exhibited by Mr. Walker.

The loss in weight was greater in the specimens at the outlet end of the several heating systems than at the inlet and except in the building which was an old two-pipe gravity system. The oxygen content of the condensate at the discharge end of all systems was greater than at the supply end, indicating that oxygen was absorbed in all types of systems.

On the whole, however, the tests were disappointing in that they did not show a consistent relation between the type of heating system and the amount of corrosion. There was little difference in the relative amount of corrosion of the three metals, but the increase as the time of exposure lengthened, was marked.

The conclusions reached by the committee were as follows:

1. Dissolved oxygen and CO_2 are causes of corrosion in consumers' heating systems.

2. We have been unable to demonstrate that corrosion is dependent upon the type of heating system, but in general it is obvious that a system is to be preferred which affords less opportunity for the aeration of the condensate.

3. Corrosion should not take place if the oxygen content is less than 0.5 cc. per litre and if the PH value is greater than 6 cc.

4. Feed-water treatment should, if possible, be so designed as to eliminate carbon dioxide from the steam. This may be very difficult.

5. Deaeration of the feed-water is desirable, but there is still the possibility of aeration of the condensate in the consumer's heating system.

In discussing the report C. H. Day of Cleveland expressed the opinion that piping now being manufactured is not of such good quality as that of former years. The most common troubles experienced by his company, the Cleveland Electric Illuminating Company, had been in vacuum heating systems. In an effort to reduce corrosion some heating companies, he said, make a practice of feeding oil into the system in small quantities and this has had a salutary effect.

Other speakers stressed the importance of this problem and suggested that the association conduct an extensive research in pipe corrosion.

Professor J. D. Hoffman of Purdue University, Lafayette, Ind., addressed the convention taking as his subject, "The Engineer As a Community Asset." He said, in part:

The Engineer as a Community Asset

In a survey of the entire field of engineering for the purpose of selecting my topic for this address I could think of no phase of the engineers work more productive of great results than the increasing demand for his engineering talents in the solution of community problems.

Fifty years ago he enjoyed a very limited sphere of influence. His power was felt in the drawing and design room, the shop, the laboratory, the power plant and the mill, but he was not in fact a community asset, excepting as his technical services in machine or plant production eventually served as community betterments.

To-day he has a nation-wide, not to say an international, viewpoint. He is an economist who co-operates, eliminates and consolidates for better efficiency in the solution of national as well as local community problems. With all due respect to our statesmen, our politicians, our counsellors in these matters of years ago, and with due credit for their accomplished results, we have now arrived at the dawn of the day of the engineer—the unbiased efficiency expert of the country.

The special training of the engineer qualifies him above other men to be a community helper. His entire training is based upon *exactness*. His mathematical training demands accuracy. A mistake in one of the simplest calculations might be the cause of the collapse of a structure or the failure of a machine. The fact that his theories are correct is not sufficient, his execution must be flawless or his work is a failure. There is no middle ground—he is either right or he is wrong. This conception of his responsibility follows throughout all his engineering training. The study of the laws of physics, mechanics, electricity, chemistry, hydraulics and thermodynamics, each fundamental to the trained engineer, all demand exactness in its most refined form; how can he be otherwise, therefore, than a stickler for exactness in every problem of community life of which he is a part?

Again, his training emphasizes the necessity for *simplification*. The demonstration of a theorem is never the most impressive until it has been reduced to its simplest form. Other things being equal, that machine is the best which has the least number of pieces and is the easiest made. That heating plant is usually the most efficient which does the required work with the least amount of mechanical appliance. Because of this fact he is always under the stress of designing and installing to promote simplicity.

Our engineer is an enemy of *waste*. He is taught the limitations of our country's natural resources and educated along the lines of the conservation of these resources. From the beginning of his engineering education throughout every day of his ceaseless toil he is taught to economize. Fuels and metals are his principal raw materials and the saving of these is the principal foundation stone of all efficiency.

In a sense, this efficiency problem has been thrust upon him. Time was when our natural raw products were abundant and cheap and his chief concern was, how fast and successfully he could turn these into a finished product, but that time has passed. His eagle eye now watches production to see that every ounce of raw product is put to an economic use.

And then again our engineer is a seeker of facts and not solely a developer of theories. In determining upon the size of an underground steam main he must have an accurate knowledge of the steam flow capacity of pipes of various diameters and lengths under varying pressure drops. Otherwise the pipe might be too large and installed at too great a first cost or it might be so small it would not do the work intended and would have to be replaced. He must know the actual stresses to be encountered and the material values to be installed in all bridge, roof, floor or machine members of his design to guarantee against failure and consequent loss of life when installed. He has been taught that the engineer can not cover up his mistakes and that the honor of his profession demands of him a knowledge of the fundamental facts before exercising his privileges as a responsible engineer. This requirement is an ever present spur to this seeker of knowledge. *And lastly*, our engineer, from his specialized training, is likely to be more *unbiased in his judgment* and better qualified to pass upon the techuical needs of a community than the average individual who is more or less influenced by how the proposition in question will effect his own personal interests.

In far too many cases in the history of almost every city or town the real interest of the public have been secondary to the wishes and design of those men in authority who have traded upon the public honor for private gain. A part of the engineer's training is the observance of a code of honor which is along the line of maintaining a high personal integrity, and I am glad to say that those of their number who fall by the way into the ruts of questionable dealing are exceptionally few.

Wednesday Morning Session, May 20

Committee reports on station operating and on operating statistics opened the Wednesday morning session. For the Station Operating Committee, Chairman R. G. Felger of the Detroit Edison Company, presented a number of articles on different phases of station operation contributed by member

companies. These covered a statement on hydraulic-drive Taylor stoker, flue blower tests, Tracy purifiers, smoke indicators, purification of gases for CO_2 machines, operation of 2800 K.W. non-condensing turbines used for supplying low-pressure steam to the steam distribution system of the Rochester, N. Y., Gas & Electric Corporation, report on apparatus at the plant of the Illinois Electric Power Company, in Peoria, and refractory materials.

The report of the Committee on Operating Statistics, J. C. Butler, chairman, was based, as in previous years, on information obtained through questionnaires mailed to the member companies. Following are the main points brought out in the report.

Report of Committee on Operating Statistics

The committee on operating statistics based its report on data secured from questionnaires returned by member companies, of which 30 responded. This small return is due, largely, to the fact that many of the heating companies operate in connection with electric lighting and power stations.

With a few exceptions, conditions have not changed materially since the last annual report, and the essence of the returns may be expressed in the following tabulations:

Number of customers: (30 companies).

Smallest company	22
Largest company	2047
Total of all companies	9320
Average per company	311

Of the 30 companies reporting, 28 divided their customers as follows:

Residential	672
Business	5621

Steam produced or purchased: (29 companies).

Smallest company.	52,300,000 lbs.
Largest company.	2,461,635,000 lbs.
Average	453,000,000 lbs.

Steam sold: (26 companies).

Exhaust steam	1,620,800,000 lbs.
Live steam	7,907,420.000 lbs.
Total	9,528,220,000 lbs.

Average steam sold per customer: (29 companies).

Co. with smallest aver.	197,000 lbs.
Co. with largest aver.	11,300,000 lbs.
Average of all companies.	1,165,000 lbs.

Annual load factor, steam sold basis: (21 companies).

Minimum	13.8%
Maximum	33.7%
Average	21.8%

Connected load, equivalent direct radiation in square feet: (25 companies).

Total	16,512,000 sq. ft.
Smallest company.	48,000 sq. ft.
Largest company.	4,090,000 sq. ft.
Average	660,000 sq. ft.

Heating season:

Average length	258 days
Average temperature	41° F.

Income per 1000 lbs. of steam: (25 companies).

Minimum	$0.59
Maximum	1.44
Average	0.91

The committee found that it was practically impossible to deduce an accurate figure for the cost of steam, as delivered to the customer, on account of the many factors involved, the wide variation in different parts of the country and the lack of uniformity in investment conditions.

The nearest approach to indicative figures are the following, compiled from the questionnaire data, but not calculated:

(Interest, taxes, depreciation, etc., have been assumed to total, on the estimated average valuation, 13.5%).

Operating	53.1%
Maintenance	7.5%
General expense	4.9%
Interest, taxes, depreciation, etc. as above	34.5%
	100%

Of the thirty companies replying to the questionnaire, only two were independent heating companies, 27 were associated with electrical companies, and one was municipally operate.

No attempt was made to collect data from the hot-water companies, as was done last year.

DISCUSSION OF COAL SITUATION

One of the most important addresses of the meeting was delivered by L. E. Young, of the Union Electric Light & Power Company, St. Louis, dealing with conditions in the coal-mining industry. One of the significant statements made by Mr. Young was that engineers and operators must be prepared to take coal as it comes from the mines in place of the present practice of buying it on a B.T.U. basis. It will be poor coal, he said, but the heating companies must learn to burn it. Another significant statement was that coal is worth but 3c a ton in the ground, while the cost of loading it into the mine cars is 83c a ton. Improved mining machinery, he said, has been developed and is practically ready for use which will have a marked effect in reducing the cost of coal mining. Neither he, however, nor anyone else, is able to say how long it will be before the union miners are won over to the introduction of this labor-saving machinery.

Mr. Young spoke from notes and the interest aroused in his remarks brought forth the statement that his address in full will be published in the July issue of the N.D.H.A. *Bulletin*. The session closed with a manufacturers 'round table." The speakers included J. C. Hornung of the Central Heat Appliance Company, who described the new Hornung industrial-type pressure and temperature master control; L. S. Shaw, of L. S. Shaw & Co., who described a new furnace baffle plate, a new steam trap developed by the Ellis-Drier Company of Chicago, which can be operated without a vent; and a new house heater designed to burn small sizes of coal. This is known as the Newcomb coal burner. The coal is fed to the fire-pot through a worm gear operated by an electric motor. J. H. Swan of the Klipfel Manufacturing Company, described the Klipfel line of pressure regulators for street service systems, showing their availability for automatically reducing any initial steam, air or water pressure to any desired reduced pressure above 2 lbs.

Thursday Morning Session, May 21

One of the most interesting reports of the meeting, which was presented at the opening of the Wednesday morning session, was that of the Heat Utilization Committee, J. E. Seiter, chairman.

Heat Utilization Committee Report

The report of the heat utilization committee indicated many ways in which generated heat may be conserved other than by the initial use of insulating materials when building.

Weather strips when applied, have shown savings of from 11% to 44%, the use of revolving doors has made it possible to heat lobbies previously impossible to keep warm. By the same token, the test of a garage showed that the use of automatic doors effected a saving of 53%.

An interesting section of this report deals with the correction of faults in existing heating systems, the mere rearrangement of piping saving from 10% to 30% of the heat previously used. The installation of traps has proved another fruitful move, as has the removal of pockets from mains. Pipes insufficiently covered, it was found, waste heat up to 37%.

One of the most interesting changes bringing efficiency in its wake, it was reported, has been the increase of radiation in one section of a large building, relieving the load from other overworked sections of the system. In a case cited, the saving amounted to 17.4%.

The installations of proper radiator traps and vacuum pumps have each resulted in savings, the former addition effecting a 55% saving in one case, and the latter as high as 30% out of several cases cited.

Rearrangement of mains brought about as much as 22% economy, where certain parts of a building must be heated continuously, and the balance only intermittently, and remote control valves, in several instances, saved a quarter, or more, of the total steam used.

Due to the discussion that has in the past, attended the consideration of

manual intermittent steam supply, some 35 cases were investigated and reported on, and in all but one, 10% or better, saving was effected. As high as 75% saving was reported in a single case. These economies were secured by having the building engineers watch the temperature in the building, and shut off the steam when the temperature came up to normal, turning it on when the temperature dropped.

General economic operation is a heading under which was considered all those savings accomplished by careful supervision of the heating system and the building, such as seeing that the rooms were not overheated, that windows were not opened, and, in general, being on the alert. Change of operation along these lines brought about almost incredible economies, one as high as 72% being reported in a tabulation of 27 cases, and none as low as 10%.

The use of unit thermostats produced savings, as quite extensive investigations were made in several localities, including Lima, O.; Detroit, Bloomington, Ill.; Seattle, Lansing, Mich.; and Washington, D. C. The committee found, however, that before unit thermostats are installed, a careful survey must be made to determine that the building will heat uniformly, that the heating system has good circulation, that the thermostat can be placed in a portion of the building having representative heating requirements, and that it will be so placed that it will not be tampered with. Failure to follow these precautions may entirely nullify the benefits of such installation.

In the discussion it was stated that in Chicago the local gas company is making a series of heating tests in several new buildings which have been constructed with insulating building materials. The importance of this practice is becoming more widely recognized, especially where more costly methods of heating, such as gas heating, are being adopted. Another agency conducting propaganda to the same end is the Better Building Bureau, of Chicago.

It was at this point in the discussion that C. H. Day made the proposal that the association undertake the preparation of a moving picture film depicting the many ways in which householders waste heat and showing methods by which savings could be made. Such a film, he said, could depict the hero entering a steam-heated room and upon finding it overheated, throwing open the windows without even looking to see whether or not the radiators were turned on. The resulting waste from this and similar practices could be shown in a graphical manner by the diminishing coal piles, contrasted with those resulting from more careful operation.

Mr. Day's suggestion was warmly seconded by H. C. Kimbrough who proposed the appointment of a committee to look further into the matter. This motion, which was unanimously endorsed, resulted in the appointment of C. H. Day, chairman; W. W. Stevenson and H. R. Wetherell, as the committee to go forward with the plan.

NEW OFFICERS

The report of the Nominating Committee was made at this session, the ticket, which was later elected, being as follows:

President, Earle Shultz, vice-president and manager of the Illinois Maintenance Company, Chicago, and past-president of the Building Owners' and Managers' Association.

First vice-president, J. E. Seiter, Detroit Edison Company.

Second vice-president, C. A. Gillham, president of the New York Steam Corporation.

Third vice-president, C. H. Day, of the Cleveland Electric Illuminating Company.

Secretary-treasurer, D. L. Gaskill, Greenville, O.

Members of executive committee: D. L. Gaskill, W. W. Stevenson, Allegheny County Steam Heating Company, Pittsburgh.

MR. SHULTZ'S ADDRESS

The fact that Mr. Shultz was next on the program for an address proved a happy coincidence and he received an enthusiastic greeting as he stepped to the platform. His address was a carefully thought-out analysis of present tendencies in the district heating field and held the close attention of the convention.

District heating, he said, is most profitable in congested business districts and the trend at the present time is to divorce it from the electrical end of the business. He listed the advantages of district heating under the general division of (1) convenience and service, under which he discussed the civic features of central heating in such ways as relieving traffic conditions due to the carting of coal and ashes to and from individual plants; (2) possibilities of fuel savings, and (3) possibilities of investment savings on the part of the customer. On this point he called attention to the fact that we are now at the end of the first generation, so to speak, of office buildings and the remodeling of such buildings may be expected. The elimination of individual heating plants in such remodeling work will result in important investment savings.

The district heating plant, Mr. Shultz declared, should not be considered a competitor of the isolated plant, although in new buildings, when the investment costs are considered, it can compete with individual plants.

Discussing the investment feature in detail he stated that the investment charge for the isolated heating plant will come to 30% of the total cost of the building. The investment charge, therefore, may easily offset any increased efficiency obtained in individual installations.

District heating plants, he said, should be designed for overloads as this would have the effect of reducing the high cost of peak load capacity. In Chicago, he said, the practice was being followed of renting plants from some customers and in some cases, of buying steam from them, to meet peak-load conditions.

On the question of rates, Mr. Shultz endorsed the idea of considering the "maximum demand" element in formulating rates. At the same time it is important to get large customers.

Due to his connection with the National Association of Building Owners and Managers, Mr. Shultz said, he could appreciate the importance of maintaining cordial relations with building managers.

Central station heating, concluded Mr. Shultz, has taken its place among public utilities and the tendency is all toward the straight heating system.

The report of the Heating Research Committee was also presented by Mr Shultz.

Heating Research Committee Report

Office buildings only were considered when securing data by the Committee on Heating Research, as these data was deemed of greatest value to heating engineers. The data take the form used in previous years. Following the comprehensive analysis of the 1922 report, which appeared in HEATING AND VENTILATING MAGAZINE of January, 1923, the following summary tabulation is given with the 1922 figures as a basis of comparison:

COST OF POWER BY TYPE OF PLANT

Group 1—Buildings having electric elevators.

Type A—Plants buying all power

Power Items	Quantity per Sq. Ft.	Unit Cost Dollars	Cost Cents Per Sq. Ft.
Steam	....100.00 lbs.	0.711	7.11
Electricity	3.59 K.W.H.	.0205	7.36
Labor	.... .054 hrs.	.72	3.89
Total			.....$18.36
1922 Total			15,6356

Type B—Plant generating heat—buying electricity

Coal	.....22.52 lbs.	5.54	6.23
Electricity	... 3.59 K.W.H.	.0205	7.36
Labor	..... .076 hrs	.72	5.47
Total			..... 19.06
1922 Total			.....17.29

Type C—Plants generating all power			
Coal .....50.23 lbs.	5.54	13.7	
Labor ..... .154 hrs.	.72	11.1	
Total		24.8	
1922 Total		19.81	

the use of an economizer at the station under test, it was connected to two small boilers. Due to the difficulty in keeping these old boilers in operation, the economizer seldom was kept in service long.

Group 2—Buildings having hydraulic elevators.

Type D—Plants buying all power				
Steam	172.0	lbs.	.711	$12.2
Electricity	3.07	K.W.H.	.0218	6.7
Labor	.057	hrs.	.72	4.1
Total				23.0
1922 Total				25.46

Type E—Plants generating steam—buying electricity				
Coal	44.3	lbs.	5.54	12.3
Electricity	3.07	K.W.H.	.0218	6.7
Labor	.137	hrs.	.72	9.9
Total				28.9
1922 Total				27.15

Type F—Plants generating all power				
Coal	57.0	lbs.	5.54	15.8
Labor	.176	hrs.	.72	12.7
Total				28.5
1922 Total				27.98

Devices presented by the manufacturers at the close of this session were the unit heat control of the Minneapolis Heat Regulator Company, presented by C. D. Lyford and the Donnelly system of temperature control, presented by James A. Donnelly, of New York.

Friday Morning Session, May 23

Two additional committee reports were presented at the concluding session Friday morning, the first being that of the Water Heating Committee, R. C. March, of the Public Service Company of Northern Illinois, chairman.

Water Heating Committee Report

It has been the aim of the water heating committee to develop units that may be taken as a basis of comparison, and used by any operator to check up his own operating conditions. For the derivation of such a unit, an extensive test on a large hot water system by H. A. Woodworth was studied, and the analysis showed that, if the coal burned in the plant were reduced to "tons of coal per day per degree of temperature difference from 70°F," the result, for any month, or year, was almost a constant. This figure, converted to pounds per day, and then divided by the "load" on the station, in square feet of radiation, becomes a factor by which any operative may measure his performance.

That the factor is not of a high degree of accuracy is admitted, because of the many uncontrollable and undefinable elements that contribute toward its composition, yet it has been found to be fairly indicative of conditions in several applications. For instance, in

An analysis of the "coal burned" curve showed that the lowest efficiency obtained when the economizer was off. By making a few minor changes in the fan connections, the hot gases were drawn off the larger and more efficient boiler, and the economizer was kept in continuous service, future readings indicating a saving of over 1400 tons of coal, which checked very closely the calculated savings due to the use of the economizer.

It may be said that, in plants where it is possible to obtain the weight of coal fired, the factor will furnish a very good comparative check on station performance.

Tests to determine circulation quantities determined that the quantity of water required per square foot of connected radiation per hour varies from 2¾ lbs. to 4 lbs., and if a larger amount is being circulated, it should be investigated.

The report of the Distribution Committee was presented by the retiring president, O. W. Kastens, of the Consumers Power Company, Grand Rapids, Mich.

A feature of this session was an address by Vice-President and General Manager A. C. Marshall, of the Detroit Edison Company. Mr. Marshall's address was devoted to the public relations of a utility.

The election of officers brought the meeting to final adjournment.

Entertainment Features

Under the direction of a committee headed by H. C. Kimbrough and including J. E. Seiter. H. R. Wetherell, D. S. Boyden, W. J. Kline, J. C. Butler and W. K. Abernathy, a delightful entertainment program was carried out which included golf for the men and card playing and drives for the ladies and dancing for all. In addition one evening was devoted to a trip to Brown's at French Lick Springs.

Immediately upon arrival the golfing enthusiasts were separated from the mere delegates and formed a convention, as it were, of their own. A notice that the golf course adjoined the hotel was found to be literally correct, but when it was discovered that the first tee was some 300 ft. above the level of the hotel the convenience of taxicabs to make the climb was more than appreciated. The ride for the ladies took them through thirty miles of beautiful Hoosier country whose rolling hills and wide vistas were thoroughly enjoyed.

Following two days' preliminary golf play at the West Baden Springs course the convention tournament was played on the lower course of the French Lick Springs Hotel and brought out a field of some thirty odd players.

The big social event of the meeting was the dinner held Thursday night at the West Baden Springs Hotel. Covers were laid for 150 members and guests. The presence of Senator Watson at the hotel and the friendship existing between him and Secretary Gaskill led to his acceptance of an invitation to make an impromptu address. He was introduced by Secretary Gaskill and in a happy speech he glorified industry as the source of our greatest happiness and advance in civilization. Secretary Gaskill then presented a gold past-president's badge to the retiring president, Mr. Kastens, who expressed his appreciation of the honor. The toastmaster then resigned his office to Chairman Davis S. Boyden, of the tournament committee, who presented the golf prizes, while to W. K. Abernathy was delegated the office of presenting the ladies' prizes won at the card games.

Oil and Gas Power Week

Great success attended the efforts of the national technical societies to provide high-class programs on oil and gas power, throughout the entire country, during the week beginning April 20. The meetings, as a rule, centered around local chapters of the national societies, and technical schools, were well attended, and the papers read were representative and covered the field thoroughly.

Of special interest in the heating field were the following: "Boilers Efficiently Using Oil and Gas Fuels," by G. L. Warden, at Los Angeles; "The Use of Oil-Fired Furnaces in Residences," by A. M. Schoen, Atlanta; "Oil, Its Benefits as Fuel," by R. A. King, Chicago; "Consumption of Fuel Oil," by E. J. Larkin, Minneapolis; "Increased Use of Fuel Oil," by R. C. Demary, Akron, O.; "Possibilities of Gas and Oil as to Heat and Power," by Burlington, Vt., and "Fuel Oil and Its Use in Porto Rico," by M. Vasquez, Mayaguez, Porto Rico.

Wisconsin's Revised Heating and Ventilation Code

Full Text of the Latest State Law Covering Standards for Heating and Ventilation of Public Buildings and Places of Employment

Adopted April 8, 1925

(*Continued from May issue*)

3. Plans Required in Duplicate. All plans for heating and for ventilation shall be submitted in duplicate.

4. Approval of Changes in Plans. If after having been approved by the Industrial Commission, plans or specifications are changed in any respect covered by this code, such changes shall be submitted to the Industrial Commission for approval. All work shall be executed according to the approved plans and specifications, or the approved alterations.

5. Approved Plans Kept at Building. A complete set of approved plans and specifications showing identity of approval shall be kept at the building at all times during building construction and installation of equipment.

6. Data Required on Plans and in Specifications. The lines, data and information shown on plans for heating systems and ventilation systems submitted for approval shall be reasonably permanent, clear, legible and complete, and shall include all details and data necessary for review of installation, such as:

a. Building; name, type, location, on each sheet.
b. Owner; name, on each sheet.
c. Architect; name, on title sheet.
d. Engineer or designer; name on each sheet.
e. North points on general plans.
f. General plans, including attic and roof layouts.
g. General plan dimensions and height of all rooms.
h. Intended use of all rooms..
i. Thickness of walls and type of construction.
j. Vertical sections and elevations necessary to show profiles of installation.
k. Sizes and continuity of all ducts and flues.
l. Location and type of all principal units of equipment.
m. Chimney size, shape and height above primary grate of heater.
n. Specifications shall be properly identified with plans.

7. Special Data Required. All plans or specifications submitted for approval shall be accompanied by data sheets giving the amount of radiation calculated for each room on direct radiation installation, amount of air and delivery temperature calculated for each room for furnace installations, amount of air and delivery temperature calculated for all ventilation, amount of indirect radiation, and other data needed to judge the capacity and performance of an installation. There shall also be furnished a statement of sizes and ratings of boilers, furnaces and other heaters, fans and all other equipment. Upon demand the Industrial Commission shall be furnished with complete heat loss calculations.

8. Fundamental Data Required. Fundamental data pertaining to design and operation of equipment shall be filed with the Industrial Commission by manufacturers before such equipment is installed or used.

Order 5821—Accident Prevention and Fire Protection.

1. Guards. All mechanical apparatus shall be guarded in compliance with General Orders on Safety issued by the Industrial Commission.

2. Fire Protection. All installations under this code shall comply with the precautionary requirements of the Industrial Commission to reduce fire hazards.

Order 5822—Design.

1. Adequacy. All heating and ventilation installations shall be designed, installed, maintained and operated adequate for the service required by this code.

2. Cacapity and Arrangement. The calculated capacity and the arrangement of all installations for required heating and for ventilation shall be based upon simultaneous service to all parts of the building, unless otherwise provided in this code.

3. Basis for Heat Calculations. In the accompanying map the State has been divided into three zones of coldest weather temperatures recorded for included localities by the U. S. Weather Bureau during the last ten years. Maximum heat losses for a heating system shall be calculated on the basis of cold weather temperatures not more than 10° F. warmer than the zone average of the zone in which the installation is located.

44. Provision for Cleanliness. All parts of installations and equipment which house or handle air used for ventilation purposes shall be designed so as to facilitate sanitary maintenance thereof.

NOTE:

1. Sheet-Metal Ducts. Sheet-metal ducts should be provided with plenty of clean-outs so that the piping system can be cleaned by operation of fan or hand-tools. By placing a clean-out at or near each horizontal or vertical turn, at or near the points of minimum normal air pressure and travel, it is often possible by closing most or all of the discharges and opening individual clean-outs in turn, to cause enough extra flow of air to remove much of the dust and dirt that has settled in the piping system under normal operation conditions. In this connection it is generally advisable to insert a stop in the pipe beyond the opened clean-out. Hand-tool swabs are sometimes used for cleaning otherwise difficult parts in ducts.

2. Masonry Ducts. Horizontal masonry ducts should be constructed, arranged and equipped for washing down with hose water, and large ones should be provided with sufficient illumination to facilitate both cleaning and inspection services.

Order 5823—Air Supply.

1. Uncontaminated Source. The fresh air shall be taken from a relatively uncontaminated source outside of the building.

2. Maximum Inlet Temperature, 120° F. The calculated room inlet temperature of air used for heating and ventilation purposes shall not exceed 120° F. unless approved in writing by the Industrial Commission.

NOTE: In gravity systems it is intended to base the heater capacity, arrangement and control upon inlet temperatures not exceeding 120° F., although in practice it may sometimes be necessary to heat the air to higher temperatures in order to drive it into the room.

3. Control. Adequate control of temperature and other conditions and effects of heating and of ventilation, shall be provided and maintained and operated for all heating and all ventilation systems.

4. Recirculation. Where the design, equipment and control of a ventilation system in all parts and as a whole is such as to promote, encourage and reasonably assure consistent operation, recirculation will be permitted as follows:

(A) 50% recirculation, during occupancy, from occupied areas having no other contamination than human occupancy, without special cleansing devices other than screens at intakes;

(B) 75% recirculation, during occu-

pancy, from occupied areas having no poisonous or injurious contamination, where an effective approved dust eliminator is operated in the air supply circuits;

(C) 100% recirculation while building is entirely unoccupied.

Order 5824—Heating, Ventilation and Exhaust Systems—General.

1. Heating Systems Required. Adequate and appropriate heating systems shall be provided, maintained and operated for all occupied areas within the scope of this code.

2. Ventilation Systems Required. Ventilation systems shall be provided, maintained and operated to accomplish required ventilation service for all occupied areas within the scope of this code.

NOTE: This includes all places of employment or occupancy where smoke, gas, dust, fumes, steam, vapor, foul air, industrial poisons, or other detrimental materials, are used, stored, handled or are present in the air in sufficient quantities to obstruct the vision, or to be irritating, or to be injurious to the health, safety or welfare of the employees or frequenters.

3. Gravity Direct-Indirect Systems, Prohibited. Gravity direct-indirect systems shall not be considered permissible for installation under this code.

NOTE: This clause is intended to prohibit the use of so-called direct-indirect radiators whereby the room air supply is supposed to be admitted directly from the outside to the base, and to be delivered at the top, of direct radiators placed in the rooms to be served, without mechanical assistance.

4. Critical Outside Temperature for Gravity Systems. Approval tests of gravity systems shall be made when there is not less than 40° F. difference between room temperature and out-door temperature. The critical elevation of tests for room-air temperature, humidities and motions, shall generally be 1 ft. above the normal seat line, where seats are used, or 4 ft. above the floor where seats are not used.

5. Exhaust Systems Required. Exhaust systems shall be provided, maintained and operated for all occupied areas, for all machines, vats, tanks, furnaces, forges, salamanders, and all equipment and processes in such areas which produce or throw off dust or particles sufficiently light to float in the air, or which emit heat, odors, fumes, spray, gas, or smoke, in such quantities as to be irritating or injurious to the health unless the general ventilation systems keep the air in the breathing zone of every employe or frequenter, pure, fresh and clean.

6. Exhaust Systems, Clean Discharge. Where necessary, exhaust systems shall include adequate dust collectors, or air washers, or other machines, contrivances or methods, whereby the discharge from the systems will be prevented from contaminating the breathing zone inside the building or becoming a nuisance or hazard either inside or outside the building.

NOTE: The intensity of suction necessary in exhaust systems depends on local conditions to such an extent that no definite intensity of suction is specified, except that it shall in all cases be maintained sufficient to accomplish the required service.

7. Tempered Air Supply for Exhaust Systems. Where ventilation is secured by exhaust methods the air which blows in to replace that exhausted from the room shall be appropriately tempered.

NOTE: Taking foul air out of a room is only part of the service required. This code requires that air exhausted from a room shall be replaced with adequate supply of air properly warmed or treated before it is admitted to the room served.

8. No Contamination of Adjacent Areas. All equipment and systems serving rooms which house sources of odors, fumes, noxious gases, smoke, steam, dust, spray, or other contamination, shall be such as to prevent spreading of any such contamination to any other occupied parts of the building.

9. Final Test Required. The performance of every heating or ventilation installation shall be thoroughly tested and balanced in place, throughout, before completion and delivery to owner. The performance of ventilation shall be balanced by metered measurements of air flow at inlets and outlets.

NOTE: Smoke Test. It is very important to make a smoke test of an ordinary chimney built into a building before accepting it, because a leaky chimney presents a serious fire hazard as well as seriously impairing the usefulness of the entire plant. An active smudge is started at base of chimney or in the heater and then the top of the chimney is closed so that no smoke can escape that way. The chimney and combustion gas passages should be so tight that no smoke will escape from any crack or crevice or loose joint.

Order 5825—Maintenance and Operation.

1. Maintenance. All heating, ventilation and exhaust installations shall be maintained in good working order.

2. Sanitary Conditions. All heating and all ventilation installations, equipment, accessories and appurtenances shall be kept clean and sanitary.

3. Operation. All heating, ventilation and exhaust installations shall be operated consistently.

NOTE: It is recommended that contractors thoroughly instruct the operators of heating and ventilation systems, and conspicuously post written or illustrated instructions for the efficient (and practical operation of the plant, be-(fore leaving the job.)

It is always desirable to install recording instruments in connection with mechanical ventilation systems. Such instruments demonstrate the consistency with which the systems are operated. A recording air pressure gauge, an odometer, a recording thermometer, or even a speedometer, will be comparatively inexpensive and will be of great assistance to adequate supervision.

In small school buildings, printed memoranda pads provided near the thermometer, are being used with a reasonable measure of success. The teachers are required to make hourly reports of thermometer readings for each day of the week.

4. Thermometers Required. A reasonably accurate thermometer shall be provided and maintained for each 1000 sq. ft. or fraction, in all occupied areas having more than 350 sq. ft. floor area, and shall be easily accessible and properly located to show temperature of the zone served.

(*To be continued in July issue.*)

Relation of the Architect to the Sub-Contractor

Practical reasons why closer co-operation between the architect and sub-contractor is of mutual advantage were presented by Robert D. Kohn, fellow of the American Institute of Architects, in a recent address before the New York City Heating and Piping Contractors' Association. The fact that Mr. Kohn has had a wide experience as an architect and served during the war as head of the Bureau of Construction qualifies him to a degree to speak on this subject. He has long been active in the work of the New York Building Congress.

Mr. Kohn said, among other things:

"I want to repeat my plea for co-operation between the various functions of the building industry whenever it is possible for me to present it. The word 'co-operation' is very much used nowa-days; its use means in the minds of many people only a friendly interest and avoidance of conflict whenever the interests of the two parties concerned do not conflict.

"In reality, real co-operation is of two kinds. Co-operation of distribution and co-operation of production. Co-operation of distribution has been successful for many years. The co-operative societies of England with their innumerable stores throughout the country; and similar institutions in Belgium and France and Germany have for years rendered valuable service to their clients in reducing prices of material through the power of joint buying in the mass. That is an entirely different matter from the very difficult subject of co-operation in production.

"Co-operation in production has generally been a failure. We who are in the building industry must find a way of securing co-operation in production, because the process of building our very complex modern structures is one of the most difficult production jobs of the country. We not only have to deal with the materials from mines and forests to the point where they are incorporated in the structure, but we also have to deal with innumerable kinds of labor, innumerable varieties of technique, and, I might almost say, innumerable kinds of technical men. The problem that we have before us, and which the Building Congress is trying to solve, is how to make each of those functions, the elements of the industry, do its own job better and to understand the problem of the other functions, so that real co-operation in this immensely difficult job may be secured.

"Now this cannot be done by the mere process of wishing it. We must get to work in the right spirit—to try to define the field of each. This is not to be done merely so that each may grab what is best for himself, but rather so he may do only what he can *best* do. The general contractor must realize that the sub-contractor has his place and value in the procedure, as the architect must realize the engineer's function in the process. And each of the distinct functions of the building industry must realize that it cannot absorb another function without lowering the quality and efficiency of the product.

"The situation is not going to be bettered by sitting down and waiting for the ills of the industry to cure themselves. Building is getting more complex every day. We have our separate organizations for every field of building. We need joint organizations like the building congress in which all the interests work together with the realization that the production of a modern structure is a process that absolutely demands intelligent production co-operation in the true sense of the word."

Manufacture of Heating Products Jumps 75% in Two Years

NEW and valuable statistics regarding the manufacture of steam fittings and steam and water heating apparatus are contained in data collected at the biennial census of manufacturers for 1923 and recently made public by the Department of Commerce. According to the data establishments engaged primarily in the manufacture of steam fittings and steam and water heating apparatus reported production valued at $221,954,313.00, an increase of 74.3% as compared with 1921, the last preceding census year. This total was made up as follows:

Cast-iron heating boilers, $3,779,869; pipe and fittings, not including steam fittings, $38,713,318; steam fittings, $18,231,022; radiators, $49,208,646; valves, $38,815,620; gauges, $3,732,378; thermostats and other heat controllers, $4,167,911; other steam and water heating apparatus, $25,443,058; contract and custom work and repairs, $1,224,830; all other products (plumbers' supplies and foundry and machine-shop products), $10,637,661.

Of the 236 establishments reporting for 1923, 45 were located in Pennsylvania, 38 in New York, 24 in Illinois, 23 in Massachusetts, 20 in Ohio, 17 in New Jersey, 10 in Michigan, and the remaining 59 in 18 other States. In 1921 the industry was represented by 274 establishments, the decrease to 236 in 1923 being due to the loss of 68 establishments which had been included for 1921 and the addition of 30 which had not been classified in this industry for 1921.

Of the 68 establishments lost to the industry, 12 had gone out of business prior to 1923, 6 were idle during the entire year, 48 had been engaged primarily in the manufacture of steam fittings and steam and water heating apparatus in 1921 but reported other commodities—stoves and appliances, warm-air furnaces, plumbers' supplies, and copper, tin, and sheet-iron work—as their principal products for 1923 and were therefore classified in the appropriate industries, and 2 reported products valued at less than $5,000. (No data are tabulated at the biennial censuses for establishments with products under $5,000 in value.)

Of the 30 establishments not previously classified in the industry, 18 were new to the census and 12 had been engaged primarily in the manufacture of other commodities, (cast and wrought-iron pipe; electrical machinery, apparatus, and supplies, brass, bronze, and copper products, and foundry and machine-shop products, etc.) in 1921.

The statistics for 1923 and 1921 are summarized in the statement below.

	1923	1921	Per cent of increase *a*
Number of establishments	236	274	—13.9
Wage earners (average number) *b*	44,141	30,808	43.3
Maximum month	Oct.....45,645	Feb.....34,667	
Minimum month	Dec.....40,334	Aug.....27,432	
Per cent. of maximum	88.4	79.1	
Wages	$64,806,855	$39,596,053	63.7
Cost of materials (including fuel and containers)	83,297,279	50,213,402	65.9
Products, total value	221,954,313	127,366,887	74.3
Cast-iron heating boilers	31,779,869	(c)	
Pipe and fittings, not including steam fittings	38,713,318	(c)	
Steam fittings	18,231,022	(c)	
Radiators	49,208,646	(c)	
Valves	38,815,620	(c)	
Gauges	3,732,378	(c)	
Thermostats and other heat controllers	4,167,911	(c)	
Other steam and water heating apparatus	25,443,058	(c)	
Contract and custom work and repairs	1,224,830	(c)	
All other products *d*	10,637,661	(c)	
Value added by manufacture *e*	138,657,034	77,153,485	79.7
Horsepower	91,460	(f)	
Coal consumed (tons of 2,000 lbs.)	274,583	(f)	

a. A minus sign (—) denotes decrease.

b. Not including salaried officers and employees nor proprietors and firm members. Statistics for these classes will be given in final report.

c. Not tabulated separately.

d. Principally plumbers' supplies and foundry and machine-shop products.

e. Total value of products less cost of materials.

f. Not reported.

Suppose That Coal Was Unknown

IF gas were the traditional fuel for heating of homes, and coal were a new fuel just breaking into the field, what would be the chances of the solid form to supplant the other?

In this fashion George S. Barrows, of Providence, R. I., formerly chairman of the heating committee of the American Gas Association, nearly ten years ago, illustrated the future of gas fuel to heat the homes of the country. In the light of developments during the intervening years, Mr. Barrows's phantasy stamps him as a prophet of no mean ability.

Mr. Barrows pictured a solicitor coming to the home to take orders for a few tons of coal.

"I want to interest you in a new fuel called coal that will cost but one-half what you pay for gas," the solicitor says.

"Fine," says the householder. "You can put in a meter for me immediately."

"But we don't sell coal through a meter. We sell it by the ton."

"Do you think I'll need a ton?"

"You'll probably need about seven tons."

"But won't that fill my cellar?"

"Only part of it, and you'll save fifty cents a ton by buying now. You can build a tight bin so that the dust from the coal won't get upstairs."

"But if I buy all my coal now I'll have to pay for it now and lose interest on my money. I've been used to getting gas without worrying about it, and I never had to pay for it until after I had used it. Still, fifty cents a ton is worth saving. How do I use it?"

"Well, you buy a special furnace, built tightly so the coal gas won't go through the house. And you've got to watch the dampers so your coal don't burn too rapidly whenever the wind is blowing. Also see that your flues are clear so you'll get enough draft to make your fire burn."

"I suppose I can use a match or a spark-lighter to start the fire just as I do with gas?"

"Oh, no! You have to start a small fire with paper and kindling wood. This is quite a job, but you can avoid doing it more than once a year by keeping your fire burning through the winter."

"But I won't need heat in the house all the time. What else do I have to do?"

"Not much, except to provide for the ashes that are left after the coal is burned. These ashes are pretty dirty and sometimes red hot when they come out of the furnace, so be sure and keep your ash cans and other containers dust tight and fire proof. At a small extra expense you can get a man to come around and cart the ashes off."

"That fifty per cent saving seems to be fading away, doesn't it? What else is there?"

"Of course, you have to be sure the fire is kept up by shovelling in coal from the bin. In cold weather you'll have to do this several times a day. You can hire a man to do it, or your wife and children could lend a hand, if they don't mind the dirt."

"Good night fifty per cent! Instead of a clean fuel which comes to me without care or worry; which I don't have to pay for until after I've used it; which I can use every bit of to heat my house; and which can be handled without work or annoyance by any of my family now, in order to use coal, I have to give up part of my nice cellar where my children play and where I store my provisions, to the storage of a fuel which you say is dirty and the ashes of which are dirtier still. I must keep my furnace in good condition to avoid the fumes of coal gas. I have to order my coal in advance without knowing how cold the winter is going to be, and then wait for it with the possibility of a strike or a transportation tie-up. I've got to hire a man to look after it, or put an additional burden on the shoulders of my family. I have an overheated house at one time and an underheated house at another—not to mention a dirty one—and all this for the saving of a few dollars a year. Frankly, I don't see where the saving comes in. Thank you for calling, but I guess I'll stick to gas."

Characteristics of an Air-Tube Copper Heater

In summing up the results of a test on an air-tube cellular type of heater, known as the Cartridge copper heater, published in last month's issue, the statement was made that "for about 14% of the space occupied and about 12% of the weight of standard cast-iron heaters tests show that Cartridge heaters can deliver a greater number of B.T.U. for equal air frictional losses." Further investigations of this heater make it appear that for about 10% of the space occupied and 7% of the weight of standard cast-iron heaters copper-tube heaters are equal in heating capacities for equal air frictional losses.

Another statement was that "the heat dissipating properties of the Cartridge heater are not proportional to the air frictional losses." To avoid any misconception on this point it should be stated that whereas the copper-tube heater in general follows the law of cast-iron and pipe-coil types, in that condensation rates are proportional to frictional losses, the frictional loss of a copper-tube heater for a given condensation rate is less than for cast-iron at moderately high air velocities and becomes progressively less for equal condensation rates as the velocity through the heater is increased.

A Four Mile Welded Steam Line

The story of the fabrication of a four-mile pipe line to carry exhaust steam for heating purposes is told in *Oxy-Acetylene Tips*, and contain some interesting data.

The line is 24 in. in diameter at the power plant, and tapers down as service branches are taken off. Steam pressure is maintained at 15 lbs., and the entire line is oxwelded.

The route is for the most part through alleys so narrow that the pipe had to be welded in the trench. This would apparently make joining very difficult, especially since there were few straight stretches along the way and the trench was narrow and rather deep. The blowpipe, however, can be used in very close quarters, so the joining was accomplished quite easily.

Work proceeded in steps. Trenching was followed by laying a continuous stretch of concrete slab for the culvert bottom. The lengths of pipe with beveled ends were lowered into the trench, lined up and welded. When service branches from the old main were reached, corresponding openings were cut with the cutting blowpipe and new connections oxwelded into the new line.

After the line was adequately tested and found perfect, pipe coverers applied a 2½-in. magnesia covering. Next came a gang which put a layer of asbestos paper over this jacket and tarred it. Form builders then erected the forms for the 6-in. concrete walls and top of the culvert. Finally, the concrete was poured, and the trench back-filled.

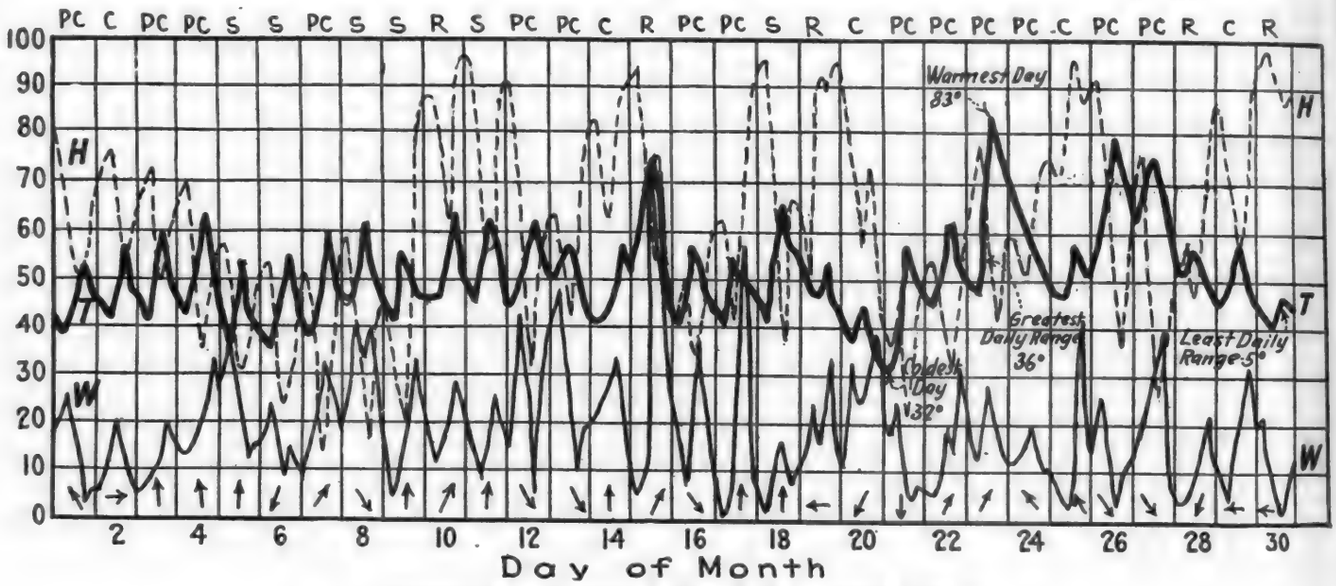
Sections in the culvert began and ended at expansion joints. Since the culvert was sealed at these points, the pipe line, besides being insulated with magnesia, asbestos paper and tar, was also given additional protection by a series of long, air-tight concrete boxes.

Because the line was welded, a considerable number of fittings were avoided, and hence the expensive hand-moulded insulating covers also. This saved a considerable amount of expenditure for insulation.

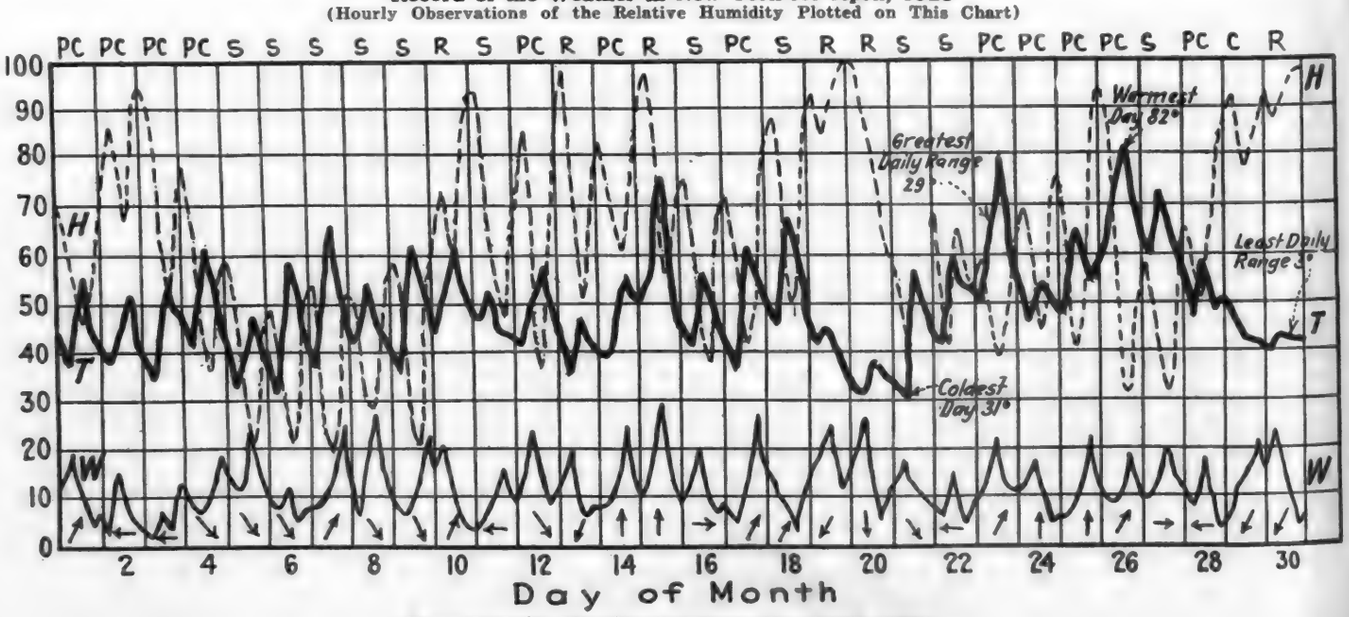
When all covering was in place, the culvert completed, and the trench filled, the public service company had a leak-proof line which they can depend upon for many years of efficient service.

The Weather for April, 1925

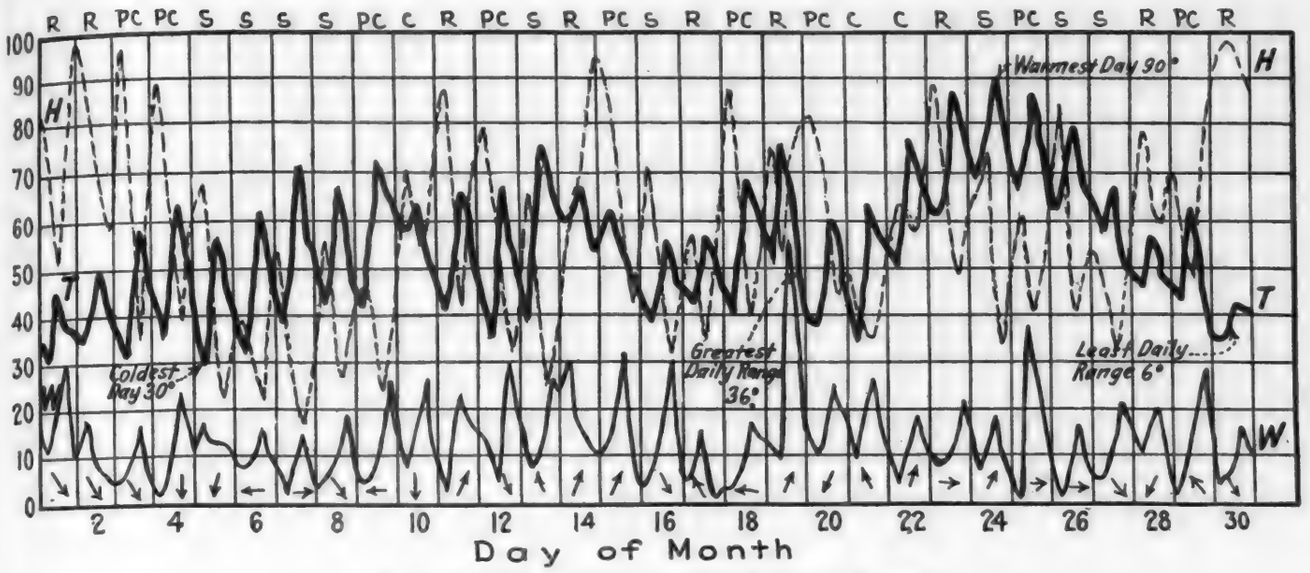
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, deg. F.	83	82	90	86	91
Date of highest temperature	23	26	24	23	22
Lowest temperature, deg. F.	32	31	30	34	36
Date of lowest temperature	21	21	5	5	5
Greatest daily range, deg. F.	36	29	36	35	31
Date of greatest daily range	23	23	19	12	6
Least daily range, deg. F.	5	3	6	7	8
Date of least daily range	30	30	30	4	9
Mean temp. for month, deg. F.	51.2	49.8	54.4	52.6	62.6
Normal mean temp. for month, deg. F.	49.4	46.4	51.2	47.7	56.1
Total precipitation, in.	1.73	2.48	1.44	3.15	2.70
Total snowfall, in.	Trace	Trace	Trace	None	None
Normal precipitation, in.	3.30	3.55	2.90	2.88	3.52
Total wind movement, miles	11492	7756	7646	8442	9975
Average hourly wind velocity, miles	16.0	10.8	10.6	11.7	13.9
Prevailing direction of wind	N	N.W.	N.W.	N	S.W.
Number of clear days	6	11	9	11	12
Number of partly cloudy days	15	13	9	8	9
Number of cloudy days	9	6	12	11	9
Number of days on which rain fell	7	8	11	9	13
Number of days on which snow fell	1	2	1	None	None



Record of the Weather in New York for April, 1925
(Hourly Observations of the Relative Humidity Plotted on This Chart)



Record of the Weather in Boston for April, 1925


R R PC PC S S S S PC C R PC S R PC S R PC R PC C C R S PC S S R PC R
Warmest Day 90°
Coldest Day 30°
Greatest Daily Range 36°
Least Daily Range 6°
H
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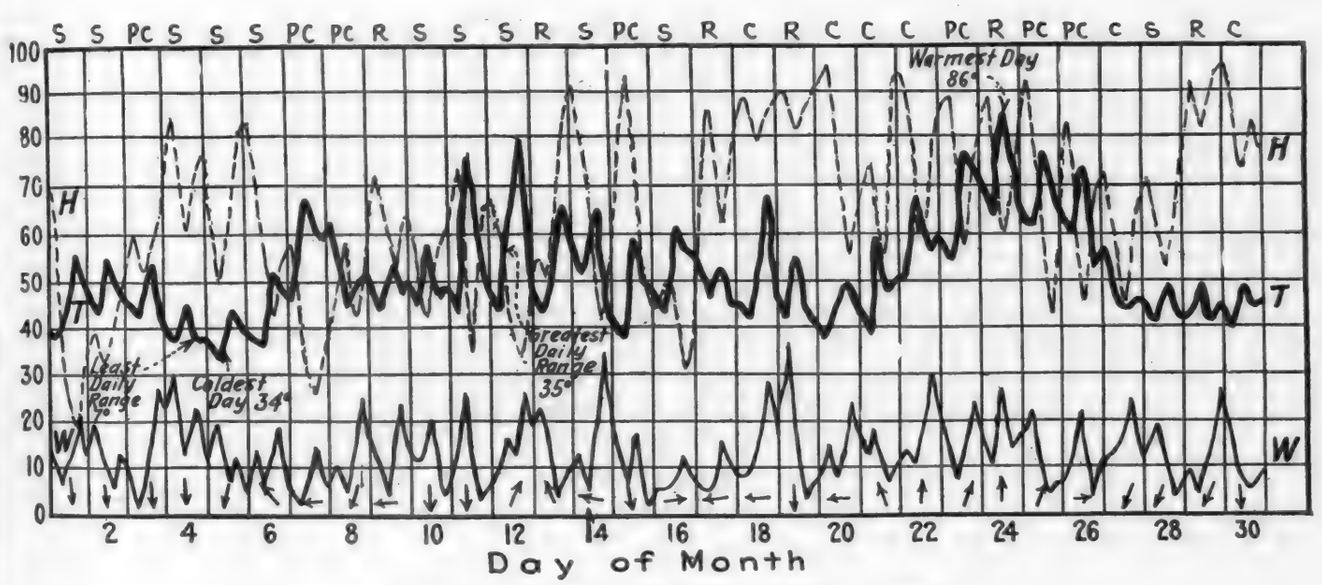
Day of Month

Record of the Weather in Pittsburgh for April, 1925


S S PC S S S PC PC R S S S R S PC S R C R C C C PC R PC PC C S R C
Warmest Day 86°
Least Daily Range 7°
Coldest Day 34°
Greatest Daily Range 35°
H
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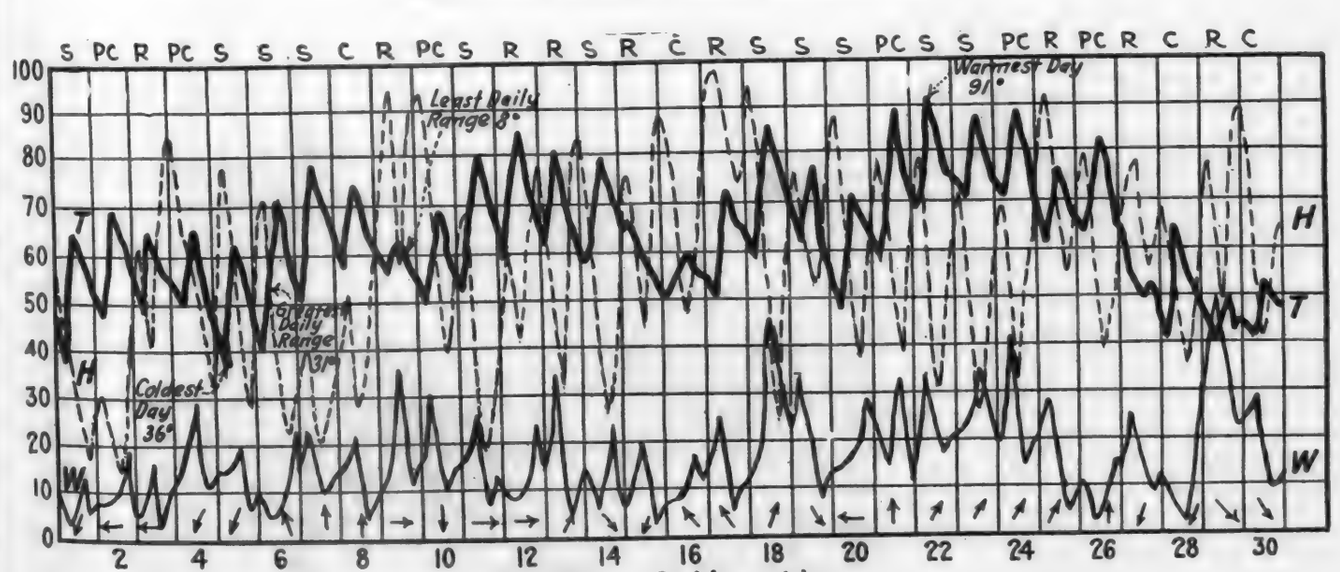
Day of Month

Record of the Weather in Chicago for April, 1925


S PC R PC S S S C R PC S R R S R C R S S S PC S S PC R PC R C R C
Warmest Day 91°
Least Daily Range 8°
Greatest Daily Range 31°
Coldest Day 36°
H
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Day of Month

Record of the Weather in St. Louis for April, 1925

Oil Burner Manufacturer Holds Record-Breaking Sales Convention

STRIKING evidence of the important place oil burning has assumed in the house heating field was given in the convention last month of over 800 distributors and salesmen of the C. U. Williams & Sons Company, of Bloomington, Ill., manufacturer of the Oil-O-Matic oil burner.

If the enthusiasm displayed, the reports made and the actual bulk of orders placed can be taken as a criterion of what may be expected in the industry at large during the coming year, there can be no doubt that the oil burner industry is in for a period of unexampled prosperity. Even if this particular gathering be taken as a big "stunt" by one of the largest manufacturers of oil burners, it, nevertheless, points the way to competitors and clearly indicates the potentialities in this field.

As the high light of the convention it was stated that orders, with deposits, had been received for over $2,000,000 worth of burners for shipment by July 13. This represents about 6,000 burners or a little less than one-sixth of the estimated output of this particular company for the coming year. It was further stated that the burners ordered for practically immediate shipment represent almost 50% of those sold during the past year and were thirty times the annual sales of four years previous. So much for figures.

CONVENTION DEDICATES NEW PLANT

Dedication of the new plant of the C. U. Williams & Sons Company took place at a luncheon in one wing of the building. This new plant will have a capacity of 1000 burners a week, and covers an acre of space. Following addresses of welcome by the Mayor and the president of the Bloomington Association of Commerce, C. U. Williams, the "daddy" of the organization, as well as the "father of the Williams boys" told of the development of the Oil-O-Matic business and of the "Oil-O-Matic idea."

He outlined the completed plans for intensive sales effort and for the necessary financing, and stated that the export business was beginning to assume proportions. As an incentive to the salesmen present, Mr. Williams told of one bonus of $1,200 to a Detroit salesman, and said that the Detroit distributor would order 800 burners for immediate delivery.

W. W. Williams then told of the development of the burner, and of his work as production manager under the new schedule. C. J. Scanlan sketched the experimental work done by the previous speaker, starting with the war period, when C. U. Williams was unable to get coal for heating a theatre, and his son built a burner, using gas oil, and managed to heat the building. His determination to produce a commercial domestic burner led to a series of experiments. In transferring oil from one tank to another, Mr. Williams observed that the discharge from the pump was frothy, due to air being mixed with the oil, and this led to the present method of atomization. Impressed with the fact that the gas pilot left much to be desired, Mr. Williams turned his attention to the ignition problem, and ultimately developed the spark coil, as a result of his experiences in the aviation service.

E. J. SMITH OUTLINES UNDERWRITERS' INSTALLATION REGULATIONS

The desire of the Underwriters to work hand-in-hand with the oil burner manufacturers toward the reduction of fire hazards, and the formulation of the new regulations for installation of oil burners and accessories was sketched by E. J. Smith, of the Underwriters' Laboratories, Chicago. Mr. Smith pointed out the great responsibility resting upon the dealer, who should see to it that each burner sold was installed with rigid regard to the new regulations, which, it is hoped, will form the basis for a standard code for communities throughout the country.

He showed that the approval of the Underwriters went beyond the mere approval of the burner, and called for installation in strict accordance with the new regulations. Mr. Smith further urged that no dealer make claims that could not be easily and entirely substantiated, especially claims that burners were so automatic and fool-proof that they could be left for days without attention.

OIL-BURNER MANUFACTURERS MUST "SELL" THE HEATING INDUSTRY

Homer Linn, of the American Radiator Company, paid his respects to the Underwriters in a story of the development of a boiler that had required two years of changing in details before it was satisfactory to the Underwriters' Laboratories, with the result that the boiler was very much better as a boiler and as a sales proposition than before.

Failure of the oil-burner manufacturers to recognize the weight of opinion of the heating engineers, and to properly place before them the technical data on their products, formed one of the most serious elements of sales resistance, according to Mr. Linn.

He said that so many of the problems of installation could be quicker and more perfectly solved through close cooperation between heating engineers and contractors, and that the latter were constantly being asked to advise clients regarding the merits of oil-burning apparatus. This could not be properly done, he said, until the manufacturer had "sold" the heating industry. Mr. Linn also indicated many of the little things to be checked up in installation work to insure best operating results.

LITTLE PROBABILITY OF OIL SHORTAGE

Vice-President R. G. Henning, of Blair & Company, New York bankers, outlined the part his company played in financing oil properties and allied businesses, and predicted a bright future for the oil burner industry. He cited various statistics to show that there was little chance of an oil shortage as far ahead as could be reasonably predicted.

WILLIAMS INSTITUTION OF HEAT RESEARCH ALUMNI ELECT OFFICERS

The roll call of the dealers present indicated that a large percentage of the roster had attended the Institute of Heat Research, developed and maintained by the company for the instruction of salesmen.

OIL BURNER ADVERTISING AND SALESMANSHIP

LeRoy A. Kling, advertising counsel to the Williams company, discussed the methods of advertising the Oil-O-Matic, and the "hook-up" between the

Oil-O-Matic Distributors and Dealers in Convention

advertising and sales forces. He stated that it was hoped to reach three out of every five families in the United States that were classified as prospects. Oral salesmanship was discussed and illustrated by R. E. Patterson Kline, who emphasized the essential points of strong personal salesmanship.

SELLING OIL BURNERS ON TIME PAYMENTS

That oil burners must be sold on time payments, as are practically all of the other necessities and luxuries, was the statement of Fred Larison, who outlined the methods of handling business on this basis. By properly handling this method, Mr. Larson said, almost any dealer could increase his sales from 300% to 400% over those done on a cash basis.

C. U. Williams then presented a cup to Mr. James, of the Detroit Engineering Corporation, and one to Spencer A. Merrell, of the Kaiser Merrell Sales Company, St. Louis, the former having sold 115 burners in one month and the latter 106. Mr. Merrell stated that, in two years, his company had installed over 600 Oil-O-Matics in St. Louis. Robert E. Nicholas told of 225 burners sold in Oak Park, Ill., by one salesman, and several other dealers and distributors told "experience" stories.

DAVID R. FORGAN GUEST OF HONOR AT BANQUET

The annual banquet was presided over by G. C. Pledger, director of the company, who introduced, as the guest of honor, David R. Forgan, president of the National Bank of the Republic, Chicago. Mr. Forgan chose as his topic, "War and Credits." He described the necessity for credits arising out of the war in almost incredible sums, and said that credits involving millions of dollars were arranged without the use of currency, simply ledger entries. Practically all of the business in the big centers, he said, was done on a credit basis, and, largely due to the war, the credit idea had spread to include nearly all of the necessities of life. However, while it is easy to extend credits, it is just as hard to pay them as any other debt, and this fact should not be lost sight of.

Mr. Forgan then briefly outlined the European situation where the war had upset all of the government financial standards, on account of the huge credits each had been forced to secure in the United States. The only way out of the difficulty, in his judgment, was the imposition of heavy taxes, restoring the internal credits of the various countries and then the borrowing of such sums from the United States as would enable them to return their currency to its par value.

During the convention one section of the factory was given over to exhibits of accessories, furnaces and boilers, by the following manufacturers: Federal Gauge Co., Chicago, Mercoid controls; P. H. MaGirl Foundry & Furniture Works, Bloomington, Ill.; Gibraltar Warm-air furnaces; Baldor Electric Co., St. Louis, electric motors; American Foundry & Furniture Works, Bloomington, Solar Heat Warm-air furnace; Meyer Furnace Co., Peoria, Ill., Warm-air furnaces; Wier Warm Air Furnace Co., Peoria, Ill., Warm-air furnaces; Hayes, Custer Co., Bloomington, Ill., Commodore warm-air furnace; Cook Electric Co., Chicago, Ill., pumps and gauges; Leader Iron Works, Decatur, Ill., tanks; C. U. Williams & Sons Co., cast-iron sectional boilers.

Joins Editorial Staff of The Heating and Ventilating Magazine

A. M. Daniels, consulting engineer, of Washington, D. C., has been appointed a contributing editor and Washington representative of THE HEATING AND VENTILATING MAGAZINE.

For the past eleven years, Mr. Daniels has devoted most of his time to design, investigational and research work relating to heating subjects for the United States Department of Agriculture, previous to which he spent nine years in two of the engineering bureaus of the Navy Department, handling heating and lighting plant designs for shore stations, and serving as civilian assistant to the Naval Machinery Trial Board. He has been a member of the American Society of Mechanical Engineers since 1915.

A. M. Daniels

Mr. Daniels is the author of a number of government bulletins. The most popular of these is entitled "Chimneys and Fireplaces," of which over 100,000 copies have been distributed. His most recent work was a project involving a comprehensive investigation of domestic oil burners on which he spent one and one-half years during which time many valuable data on this branch of heating were developed.

Mr. Daniels is the author of the "Home Study Course in Gravity Steam and Water Heating," which is being presented in monthly installments in THE HEATING AND VENTILATING MAGAZINE He will continue to handle this work and in addition will contribute articles, from time to time, on heating and ventilating subjects of interest to our readers.

He will maintain offices in Washington where he will be in a position to serve subscribers of THE HEATING AND VENTILATING MAGAZINE. Requests for information that may be obtainable from Washington should be addressed to the New York office.

Gas Industry Plans National Research Laboratory

Charles A. Munroe, chairman of the board of the Laclede Gas Light Company, St. Louis, and former president of the American Gas Association, is sponsor of a plan to institute a national research organization to be underwritten by the manufactured gas companies of the country, to develop efficient gas-burning equipment for all fuel users, and to enable the gas companies to meet the demand for gas fuel wherever heat is required.

Speaking before the annual spring conference of the A. G. A., recently in session at Atlantic City, Mr. Munroe said:

"The present tendency to conserve our national resources, especially oil and natural gas, makes it inevitable that the manufactured gas industry will

Oil-O-Matic Convention Dinner

have to shoulder the heating burdens of the country. The gas industry is now equipped to supply all the immediate fuel requirements for industry, millions of dollars having been spent for improvements and new construction during the past two years.

"We must now go a step farther by developing gas-burning appliances to make gas the universal fuel, as it is now the most economical medium, for even the most intricate and exact of heating operations."

Mr. Munroe proposed that a fund be provided to finance an organization to carry on research along these lines over a period of five years. He stated that there are companies now engaged in manufacturing industrial appliances who could undertake this work and carry it to a successful conclusion.

The Need for Better Building Construction to Save Heat

In recent years the use of frame and brick veneer houses has become almost universal in Detroit, and the insulating properties of these buildings are often far from perfect. The common construction used in building frame cottages and small houses in Detroit is to erect 2 in. x 4 in. wooden studs and cover them with ⅞ in. of wood sheathing, then a layer of heavy building paper and a light wood siding. On the inside is placed wood lath and plaster. This construction has fair insulating properties, but is not to be compared with what might be done.

If additional material of good insulating value were introduced in the wall construction, it would probably be possible to reduce the loss of heat through the walls of our houses and through the roof by as much as two-thirds with the use of adequate thermal protection. Many articles intended for this purpose are on the market to-day and are finding a limited use. The difficulty seems to be to make the house builder understand the economies of using such materials.

In the construction of some small cottages, especially those lying just outside of the city limits, it is not uncommon for unscrupulous builders to omit the sheathing and building paper and to place wide siding directly on the studs. Houses of this sort are markedly inferior to a standard house in so far as the radiation of heat is concerned, and these houses are extremely difficult to keep warm with any kind of furnace; and yet many purchasers buy these houses in apparent complete ignorance of the fact that they are being defrauded.

ROOF WASTES HEAT

Even in houses otherwise fairly built, it is quite common to ignore completely heat losses through the roof. In houses both of the cottage type and two-story type, it is not uncommon to find the ceiling of the upper floor plastered on lath attached to 2 in. x 4 in. or 2 in. x 6 in. ceiling joists, with no attic floor or covering above. Inasmuch as the ordinary shingle room permits the passage of air almost as freely as a sieve, it is evident that the attic is incapable of retaining any considerable amount of heat.

The single thickness of lath and plaster between the upper room and the attic space where the air is circulating freely, makes it nearly impossible to heat such rooms, and this is probably the prime reason why the upper floors in two-family flats are often so extremely cold. The ceiling above every room should be built at least as well as the side-wall construction and even possibly somewhat better.

Above the plastered ceiling there should be some form of heat insulation, such as heavy building paper with a flooring over it, or some other construction of this sort, as heat passes through a ceiling, if anything, more actively than through a side wall.—FRANK BURTON, *of the Detroit Aid Safety Engineering Department in Greater Detroit Magazine for May.*

All Kansas City Schools Burn Oil

In view of the rapid increase in the use of oil for fuel in homes and public buildings, it is of no small interest to learn that all of the schools in Kansas City, Mo., are using this fuel. In the words of Nate W. Downes, engineer of the School District of Kansas City, "We are using oil fuel under our boilers simply because it is the most economical thing to do at this time."

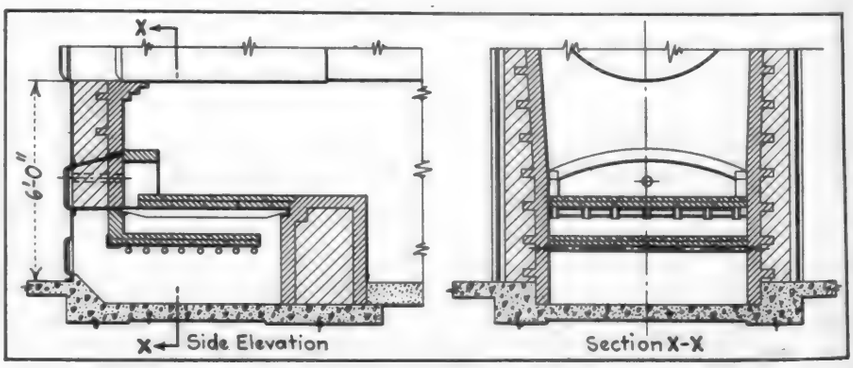
Kansas City is located on the edge of a great oil-producing area, which accounts for the fact that the school board is able to contract each August for oil for the following heating season, with the lowest bidder. The price for the past season was $1.69 per barrel, or about 4c. per gallon. At this price, coal of 12,000 B.T.U. would have to be obtainable at less than $5.00 per ton. With the market at $6.20, it is evident that, in purchasing heat units, oil is much the cheaper fuel.

With the higher boiler efficiency obtainable, with no ash problem, less labor cost and less fixed charge, considerable saving has been effected.

With admirable forethought, in view of a possible change in conditions upsetting the balance in fuel values, Mr. Downes has provided for the possible use of coal by increasing the height of the boiler settings some three feet, to allow for the introduction of stokers without disturbing the setting of the boilers.

Steam atomization of the oil is used in all plants, which are high pressure, the ventilating fans and auxiliary equipment being steam driven. The exhaust steam is used in the heating system and for water heating.

Mr. Downes states that, in his opinion, if coal is ever burned again, it will have to be in a much more efficient manner, which accounts for the provision for stokers.



Oil-Burning Boilers in Kansas City Schools Installed to Permit Eventual Use of Coal

Oil Burner Dealers in Washington Combine in Publicity Campaign

A happy variation from the conventional competitive method of belittling the other fellows products is reported from Washington, D. C., where nine manufacturers of burners listed by the Underwriters have organized to carry out a campaign to sell the idea of heating with oil fuel.

The Gardner Johnson Bureau, of Washington, which is handling the advertising, states that no attempt will be made to discuss the relative merits of burners or fuels, the whole campaign being designed to place fairly before the newspaper readers the merits of oil burning for residence use. Page space is being used, the initial advertising carrying the caption "The Modern Cellar Has No Coal Shovel." The page carries the names and addresses of the associated dealers.

New Underwriters' Regulations for Construction and Use of Oil-Burning Equipment

THE National Fire Protection Association, at its annual meeting in Chicago, May 12, 13 and 14, adopted, substantially as submitted, the report of the Committee on Flammable Liquids, which includes the regulations for the construction and installation of oil-burning equipment for domestic use.

These regulations supersede the edition of 1922, and will, it is understood, shortly be accepted by the National Board of Fire Underwriters as its standard code. Following are the regulations in full:

REGULATIONS FOR THE CONSTRUCTION AND USE OF OIL-BURNING EQUIPMENT FOR DOMESTIC USE AND FOR THE STORAGE AND USE OF OIL FUELS USED THEREWITH.

NOTE: These regulations do not apply to all burning devices employing a wick.

PREFACE

The safest type of oil burning system for domestic use is that in which all piping and the tops of tanks are located below the level of the burner base and in which the supply of oil to the burner is so controlled that breakage of any pipe or ignition failure will not result in a continuous discharge of oil into the building.

Systems employing gravity, pressure or automatic pump feed without automatic control to prevent continuous abnormal discharge of oil may introduce a greater hazard and should not be permitted unless installed in full compliance with the following regulations.

REGULATIONS

Oil used for fuel under these rules shall be a topped or distilled oil having a flash point of not less than 100° F., closed cup.

In determining the flash point, either the Elliot, Abel, Abel-Pensky or Tag Closed Testers shall be used, but the Tag Closed Tester (standardized by the United States Bureau of Standards) shall be authoritative in case of dispute. In such cases the tests shall be made in accordance with the methods of tests as adopted by the American Society for Testing Materials.

Only oil-burning systems approved by the inspection department having jurisdiction shall be used.

1. Location of Storage Tanks.

(a) Storage tanks shall preferably be located outside, underground, with top of tank below the level of the burner. Where conditions are such that top of tank is above the burner, adequate provisions to prevent syphoning shall be provided.

NOTE: For small installation where pipe lines are 1 in. or less, provisions which will break the syphon at time of fire, such as an air inlet held closed with fusible metal located at top of bend, may be acceptable. Weighted foot valves; enlarged pipe section on discharge side of syphon; or air inlets at top bends controlled by pump pressure, are provisions which may be acceptable in any size piping, depending upon the elevation of the tank, and upon specific approval of the inspection department having jurisdiction.

(b) When located inside building or above ground, the aggregate capacity of the tanks used in connection with the system shall not exceed 275 gal.

NOTE: In some territories local regulations permit gravity or pressure feed only from tanks of not to exceed 60 gal. capacity. Such tanks generally are known as auxiliary tanks and, when used, the above rule will limit the inside or above ground storage tank to a capacity of 215 gal.

2. Material and Construction of Tanks.

(a) Tanks shall be constructed of galvanized steel open hearth steel or wrought iron of a minimum gage (U. S. Standard) depending upon the capacity as given in Table 1.

For liquids heavier than 35° A.P.I. tanks may be of concrete.

TABLE 1

Capacity (Gal.)	Minimum Thickness of Material	Pounds per Square Foot
1 to 285	16 gauge	2.50
286 to 560	14 gauge	3.125
561 to 1,100	12 gauge	4.375
1,101 to 4,000	7 gauge	7.50
4,001 to 12,000	¼ inch	10.00
12,001 to 20,000	5/16 inch	12.50
20,001 to 30,000	⅜ inch	15.00

For tanks of 1,100 gal. and more, a tolerance of 10% in capacity may be allowed. Tanks of open-hearth steel or wrought-iron thinner than No. 7 gauge shall be galvanized. If adequate internal bracing is provided, tanks from 12,001 to 30,000 gal. capacity may be built of ¼ in. plate.

(b) All joints shall be riveted and caulked, brazed, welded or made tight by some equally satisfactory process. Tanks shall be tight and sufficiently strong to bear without injury the most severe strains to which they may be subjected in practice. Shells of tanks shall be properly reinforced where connections are made, and all connections made through the top of tank above the liquid level.

NOTE: Tanks for systems under pressure shall be designed for four times the maximum working pressure, and tested to twice the maximum working pressure.

(c) Underground tanks shall be thoroughly coated on the outside with tar, asphaltum or other suitable rust resisting material, dependent upon the condition of the soil in which they are placed. Where soil contains corrosive substances, special protection may be required.

(d) Inside or above ground and auxiliary tanks shall be coated with a good quality of rust resisting paint; the bottom surfaces preferably being coated with tar or asphaltum or the equivalent.

3. Venting of Tanks.

(a) An open or automatically-operated galvanized-iron vent pipe without trap and draining to the underground storage tank shall be provided.

(b) Inside or above ground and auxiliary tanks shall be provided with open vent pipe.

(c) All vent pipes shall have the lower end extend through the top into the tank for a distance of not more than 1 in. Outer ends of vent pipes shall be provided with weatherproof hoods, screened to prevent obstruction by insects and terminating at a point outside of building preferably not less than 3 ft., measured horizontally or vertically from any window or other building opening.

4. Filling Pipe.

All filling pipes shall terminate outside of buildings and when installed in the vicinity of any door or other building opening shall be as remote therefrom as possible so as to prevent liability of flow of oil or vapor through building openings; terminal shall be provided with a metal cover or cap which may be locked.

5. Manhole.

Manholes, if used, shall have covers securely fastened in order to make access difficult by unauthorized persons. No manhole shall be used for filling purposes.

6. Oil Level Indicating Device.

A test well or gauging device shall be installed on all tanks and be so designed as to prevent escape of oil or vapor within the building. Gauges employing glass parts, the breakage of which would permit the escape of oil or vapor, shall not be used. Test wells or gauges located outside of buildings shall be locked to avoid tampering.

7. Setting of Tanks.

(a) Tanks shall be buried underground with top of the tanks not less than 2 ft. below the surface of the ground, and below the level of any piping to which the tanks may be connected, except that in lieu of the 2 ft. cover tank may be buried under 12 in. of earth and a cover of reinforced concrete at least 6 in. in thickness provided, which shall extend at least 1 ft. beyond

the outline of tank in all directions; concrete slab to be set on a firm, well-tamped earth foundation. Tanks shall be securely anchored or weighted in place to prevent floating, where special conditions make it necessary.

Where a tank cannot be entirely buried, it shall be covered with earth to a depth of at least 2 ft. with a recommended slope on all sides of not less than 3 to 1, but under no circumstances shall such slope be less than 1—½ to 1, depending on the angle of repose of the earth. Such cases shall also be subject to such other requirements as may be deemed necessary by inspection department having jurisdiction.

If tank cannot be set below the level of all piping to which it is connected, satisfactory arrangements shall be provided to prevent syphoning or gravity flow in case of accident to the piping.

NOTE: Refer to note following Rule 1 (a) for suggested methods for the prevention of syphoning.

(b) Underground tanks shall be set on a firm foundation and surrounded with soft earth or sand well tamped in place.

(c) Tanks having a capacity of not to exceed 1,500 gal. when installed under buildings, shall be surrounded with soft earth or sand well tamped in place, and the floor immediately above the tank shall be of reinforced concrete at least 4 in. in thickness, capable of withstanding a uniformly distributed load of 250 lbs. per square foot, reinforcement shall extend at least 12 in. on all sides of tank.

NOTE: For installation of tanks having a capacity in excess of 1,500 gal., see Rule 8 (c), Section 1.

(d) Inside storage, gravity and auxiliary pressure tanks shall be provided with securely attached substantial incombustible supports and be securely bolted to basement floor or otherwise secured to avoid strains on piping, and shall not be located within 10 ft. measured horizontally from any fire or source of flame.

8. Gravity and Pressure Tanks.

(a) Auxiliary supply tanks may be of the gravity or pressure type if suitable automatic safeguards to prevent abnormal discharge of oil at the burner are provided. No such tank shall have a capacity sufficient for more than one day's supply and in no case shall exceed 60 gal.

(b) If located within a building, gravity tank shall not be within 5 ft. or pressure tank within 10 ft., measured horizontally from any fire or flame.

(c) Gravity or pressure tank shall be substantially and rigidly installed on incombustible supports in such a manner as to insure protection against mechanical injury.

Auxiliary pressure tanks shall be designed for six times the maximum working pressure and be tested and proven tight at twice the maximum working pressure; working pressure shall not exceed 50 lbs. Pressure tanks shall be provided with a reliable pressure gauge and an automatic relief valve piped to discharge outside of building.

9. Filling of Auxiliary Tanks.

(a) Unless filled as specified in Rule 4 auxiliary tanks shall be filled by pumping from storage tanks.

(b) Tank shall be provided with an overflow connection draining to storage than one size larger than supply pipe from pump.

(c) The overflow pipe of an auxiliary gravity tank shall not be provided with valves or obstructions; but overflow pipe of auxiliary pressure tank shall be provided with inter-connected valves or other means for automatically venting tank when filling.

10. Pumps.

(a) Oil pump used in filling auxiliary tank from the main storage tank shall be of approved type, secure against leaks, with check valves located as close to pump as convenient. Pumps shall be rigidly fastened in place.

(b) Automatic pumps not an integral part of the oil burner shall be of an approved type preferably provided with automatic means for preventing continuous discharge of oil in case of pipe breakage.

11. Piping.

(a) Standard, full weight, wrought iron, steel or brass pipe with substantial fittings shall be used and shall be carefully protected against mechanical injury in a manner satisfactory to the inspection department having jurisdiction. In all piping systems proper allowance shall be made for expansion and contraction, jarring and vibration.

All piping shall be separated from electric wires not enclosed in approved conduit, raceways and armored cable, by some continuous and firmly fixed non-conductor creating a permanent separation, as provided in the National Electrical Code.

The use of tubing of any kind is prohibited.

(b) Supply pipe shall be not less than one-fourth inch in diameter iron pipe size, and when oil is pumped to the burner, return pipes shall be at least the same size.

(c) Pipe connections to tanks shall be suitably reinforced and proper allowance made for expansion and contraction, jarring and vibration.

(d) Openings for pipes through masonry walls below the ground level shall be made oil-tight and securely packed with flexible material.

(e) All connections shall be made perfectly tight with well fitted joints. Unions shall be used at burners to facilitate removal. All unions shall be of approved type, having conically faced joints, obviating the use of packing or gaskets.

(f) Piping shall be run as directly as possible and in the case of pumping systems, so laid that if practicable the pipes are pitched back toward the storage tank without traps.

(g) Systems under pressure shall be designed for six times the working pressure and installation when complete shall be tested and proven tight at twice the maximum working pressure.

12. Valves.

(a) Readily accessible valves shall be provided near each burner and also close to the auxiliary tank in the pipe line to burners.

(b) Control valves shall be of approved type provided with stuffing box of liberal size, containing the removable cupped gland designed to compress the packing against the valve stem and arranged so as to facilitate removal. Valve shall be designed to close against the supply, and to prevent withdrawal of stem by continued operation of the handwheel. The use of packing affected by the oil or heat is prohibited.

13. Emergency Control.

Means for remote control of the flow of oil to the burner should be provided for use in emergency, and a sign indicating its purpose should be located at the control device.

NOTE: A switch in the motor supply circuit may serve this purpose for an electrically driven equipment, or a quick closing valve in the oil supply line, arranged to be operated from a safe location, preferably outside the building, may be used.

14. Burners.

(a) The size of the orifice through which the oil is supplied to the burner shall be limited to furnish only sufficient oil for maximum burning conditions when the controlling valves are wide open.

(b) Valves shall be arranged so as not to enlarge the orifice.

(c) Burners containing chambers which allow the dangerous accumulation of gases, or oil conveying pipes or parts subject to intense heat or stoppage due to carbonization are prohibited.

(d) Burners shall be so designed as to permit of ready cleaning and not allow the leakage of oil.

15. Pilot Light.

Automatic systems shall be so designed that the flame cannot be extinguished by operation of the automatic control valve, or a gas pilot light shall be provided in the combustion chamber.

16. Furnaces or Ranges.

(a) Previous to the installation of the burner, the ash door of the furnace shall be permanently removed, or bottom ventilation otherwise provided to prevent the accumulation of vapors within the ash pit unless burner is of type which mechanically purges ash pit.

TEMPERATURE-TIME CONVERSION TO "DEGREE-DAYS"

Table Developing "d-d" for Various Cities.

City		Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total of Year	Percent Used in Maximum Month	Approximate Degree Days = Total × 30
Ideal Case	×	38	37	33	22	10	1				21	30	38	270	8.3	Skin where x = 65—Temp.
Bismarck	×	38	37	33	22	10	1				21	30	38	270	13.8	9,570
St. Paul	×	37	35	27	15	4					17	24	35	254	17.1	7,620
Helena	×	37	34	28	18	6					17	24	34	252	19.8	7,560
Sioux City	×	37	34	28	17	4					17	24	34	249	19.8	7,470
Buffalo	×	37	34	28	19	6					17	24	34	253	19.1	7,590
Albany	×	37	34	28	19	7					17	24	34	254	19.1	7,620
Detroit	×	37	34	28	19	9					17	24	34	256	19.1	7,680
Chicago	×	37	34	28	19	9					17	24	34	256	19.1	7,680
Spokane	×	37	34	28	19	9	3				17	24	34	259	19.1	7,770
Cleveland	×	37	34	28	19	8					17	24	34	255	18.5	7,650
Boston	×	36	34	28	19	8					17	24	34	254	18.5	7,620
Denver	×	36	34	28	19	7					17	24	34	253	18.4	7,590
Santa Fe	×	36	34	28	19	8					17	24	34	254	18.4	7,620
Denver	×	36	34	28	19	7					17	24	34	253	18.4	7,590
Salt Lake City	×	36	34	28	19	7					17	24	34	253	18.4	7,590
Kansas City	×	35	34	27	17	6					16	24	34	247	18.1	7,410
New York	×	35	34	27	17	6	1				16	24	34	248	18.1	7,440
Seattle	×	36	34	28	19	8	2				17	24	34	254	18.5	7,620
Pittsburgh	×	35	33	24	15	2					16	24	34	240	17.5	7,200
Cincinnati	×	35	33	24	15	3					16	24	34	241	17.5	7,230
Asheville	×	36	33	25	16	5					16	24	34	243	17.7	7,290
Oklahoma City	×	36	33	25	16	5					16	24	34	243	17.7	7,290
San Francisco	×	35	33	25	14	3					16	24	34	239	17.4	7,170
Memphis	×	35	33	25	13	4					16	24	34	239	17.4	7,170
Atlanta	×	35	33	25	13	4					16	24	34	239	17.4	7,170
Charleston	×	35	33	25	13	4					16	24	34	239	17.4	7,170
Dallas	×	35	33	25	13	4					16	24	34	239	17.4	7,170
Los Angeles	×	35	33	25	13	3					16	24	34	238	17.4	7,140
Phoenix	×	34	33	24	11	3					15	24	34	232	16.9	6,960
San Antonio	×	34	33	24	11	3					15	24	34	232	16.9	6,960
New Orleans	×	34	33	24	11	3					15	24	34	232	16.9	6,960
Jacksonville	×	34	33	24	11	3					15	24	34	232	16.9	6,960
Galveston	×	34	33	24	11	3					15	24	34	232	16.9	6,960

Temperature-Time Conversion to "Degree-Days"—Table Developing "d-d" for Various Cities. — **No. 4-H**

TEMPERATURE-TIME CONVERSION TO "DEGREE-DAYS"

Definition and Applications.

In order to formulate a basis upon which comparisons of heating loads in various parts of the country might be intelligently made, the staff of the American Gas Association has devised the method here described, and has coined the expression "degree day." This unit is the product of one day of time and one degree of temperature.

Manifestly, for each locality, there may be determined, from the data supplied by the U. S. Weather Bureau, the number of days of the year for which the average temperature is below any given figure. This period may be called the heating season.

In fixing the point of "a mean daily temperature of 65° F." as the boundary of the heating season, the A. G. A. made a comprehensive study of actual conditions, and found this to be the average temperature below which heating is required. It must be borne in mind that, with a daily *mean* temperature of 65° F., the day-time temperature will average around 70° F., and the only time room temperatures would be below the comfort point would be around midnight. This explains the derivation of this arbitrary figure.

The "degree days" given in the table, then, represent the relative heating loads of the points named, and are available as comparative indices.

Reference to Table 1 (see Data Sheet No. 4-H) will show that Phoenix, Ariz., has an annual load of 1500 d.d., Memphis, Tenn., twice that of Phoenix; St. Louis, Mo., three times that of Phoenix; Santa Fe, N. M., four times that of Phoenix and Bismarck, N. D., over six times that of Phoenix.

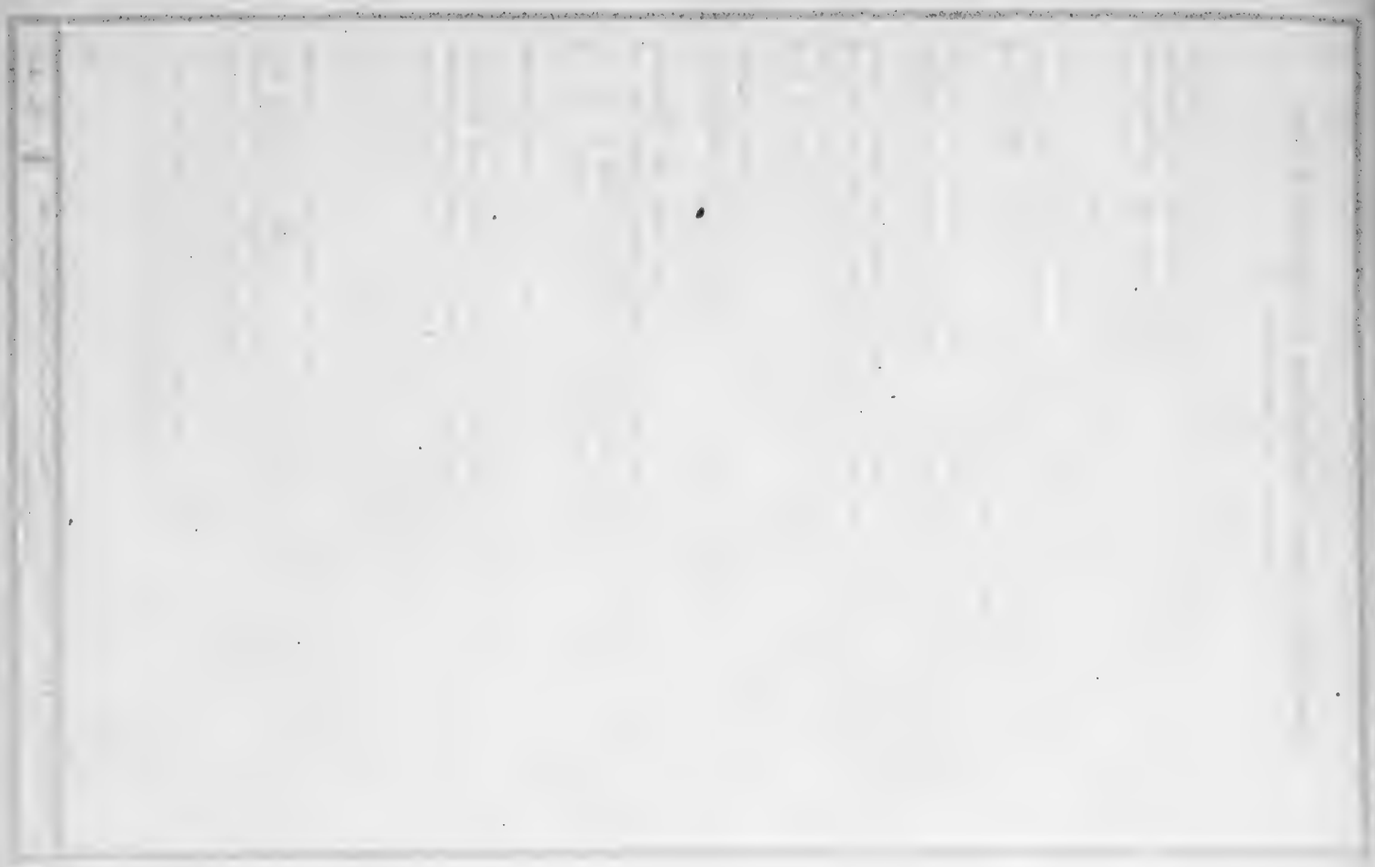
These data are taken from recorded temperature observations covering from twenty to fifty years, and it is interesting to develop variations from these figures. Taking New York City, for example (see Table 2, Data Sheet No. 4-J), the exact average is 5,276 d.d. During the winter of 1917-1918, the actual requirements were 5,898, while in the following season, there were only 4,636 d.d.

Thus, one of these successive winters was 11.7% above the average, and the other, 12.1% below.

The variation in monthly heating requirements throughout the heating season in any city may be plotted from the data in this table, and will show, for instance, that, in San Francisco, heat is required every month in the year, only 13% of the total season requirements being used in any one month. On the other hand, Galveston, Tex., uses heat only in five months, and in a single month requires 34.3% of the entire seasonal load.

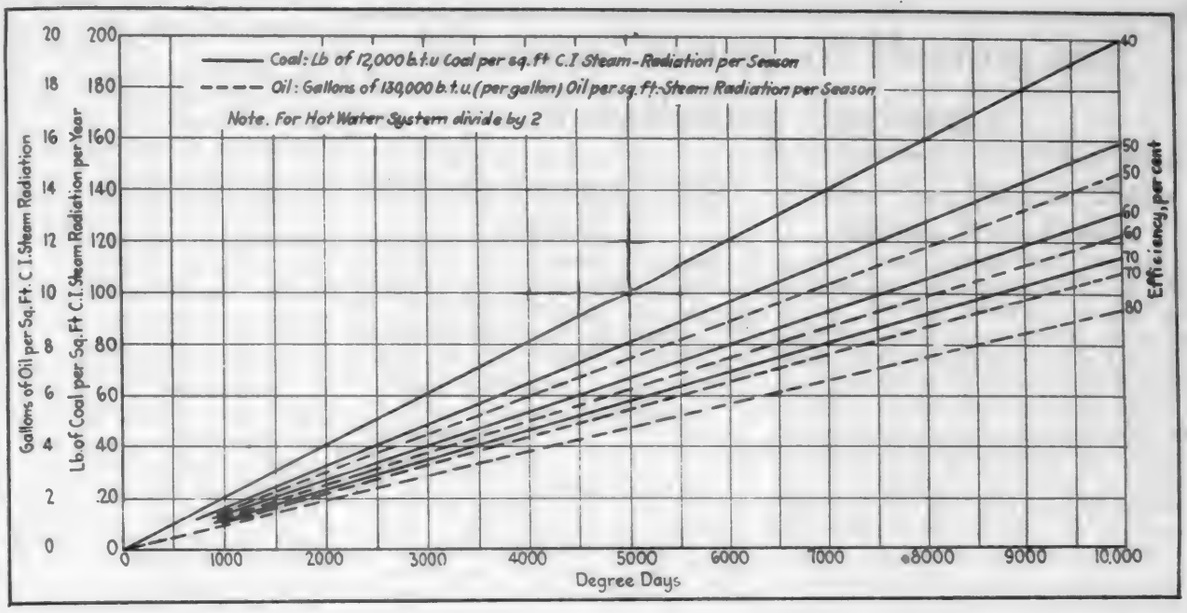
Further study of these data will reveal many interesting and valuable derivations.

Temperature-Time Conversion to "Degree-Days"—Definition and Applications. — **No. 4-G**



TEMPERATURE-TIME CONVERSION TO "DEGREE-DAYS"

Annual Coal and Oil Fuel Requirements at Different Boiler Efficiencies.



Temperature-Time Conversion to "Degree-Days"—Annual Coal and Oil Fuel Requirements, Different Boiler Efficiencies. No. 4-I

TEMPERATURE-TIME CONVERSION TO "DEGREE-DAYS"

Degree-Day Variations in Different Years, and Corresponding Variation in Annual B. T. U. Required.

Month	Days	Monthly Mean Degrees Fahr. Below 65°			Degree-Days. For Month			Percentage of Total Degree-Days Per Month			Million B.T.U. Required, per Month, per 1,000 Sq. Ft. of Cast Iron Steam Radiation		
		Winter 1917-1918	Winter 1918-1919	Average Since 1871	Winter 1917-1918	Winter 1918-1919	Average Since 1871	Winter 1917-1918	Winter 1918-1919	Average Since 1871	Winter 1917-1918	Winter 1918-1919	Average Since 1871
September....	10	2.0	2.2	....	20	22	....	.3	.5	....	2.10	2.76	.....
October.....	31	13.0	6.4	9.0	403	198	279	6.8	4.3	5.3	47.88	23.82	33.42
November.....	30	23.0	19.3	21.0	690	579	630	11.7	12.5	11.9	82.32	69.18	75.00
December.....	31	40.0	26.0	30.9	1,240	806	958	21.1	17.4	18.1	148.50	96.30	114.00
January.....	31	43.4	29.8	34.2	1,345	924	1,060	22.9	19.9	20.1	161.34	110.10	126.60
February.....	28	35.4	30.3	34.3	991	848	960	16.8	18.3	18.2	118.20	101.28	114.60
March.....	31	23.8	23.0	26.8	738	713	831	12.5	15.4	15.8	87.90	85.20	99.60
April.....	30	15.2	16.2	16.1	456	486	483	7.7	10.4	9.2	54.18	57.60	57.96
May.....	15	1.0	4.0	5.0	15	60	75	.2	1.3	1.4	1.38	7.20	8.82
Total.....	237				5,898	4,636	5,276	100.0	100.0	100.0	703.80	553.44	630.00

Temperature-Time Conversion to "Degree-Days"—"d-d" Annual Variations—Corresponding B. T. U. Variation. No. 4-J

When ash door is closed it is recommended that other doors of furnace be arranged to swing from the top or be otherwise arranged to relieve pressure sometimes caused by puffs or backfire due to delayed ignition.

(b) Stoves or ranges originally designed for use of fuel other than oil should not be used in connection with oil burners unless spaces in which vapors might collect are adequately vented.

(c) Dampers which may entirely close the chimney uptake are prohibited. Damper area should be carefully determined in each case but in no case shall it be greater than 80 per cent of the internal cross sectional area of the uptake.

(d) No combustible material shall be stored within 10 ft. of furnace door.

(e) It is recommended that where automatic operation is provided by means of a room thermostat the installation should be equipped with an additional thermostatic control to prevent abnormal water temperature, abnormal steam pressure or overheated hot air furnace ducts. Such automatic shut-off device should be so arranged that it must be reset manually.

17. Fire Protection.

(a) Any woodwork, wooden lath and plaster partition or other combustible material within 4 ft. of the sides or back or—feet from the front of the furnace shall be covered with approved plaster board or other approved incombustible material. Above the furnace there shall be constructed a ceiling consisting of plaster board covered with sheet metal, or cement plaster on metal lath; said ceiling shall extend 4 ft. beyond the sides and back and 8 ft. from the front.

At least a 36-in. clearance is necessary between top and sides of breeching and flues from ceilings, partitions and other combustible material, unless the breeching and flues are insulated with 2 in. to 4 in. of asbestic magnesia lagging or equivalent in which case the clearance may be reduced to 18 in.

(b) Near the furnace, and so located as to be convenient for use in emergency, there shall be provided a hand fire extinguisher of approved type suitable for use on oil fires.

18. Instruction Card.

A card giving complete instructions in regard to the care and operation of the system shall be permanently posted near the apparatus. Said card shall be placed under glass and framed.

19. Installation.

Oil burning equipment shall be installed only by properly qualified mechanics experienced in this kind of work. It is recommended that systems be installed by the manufacturer.

Revision of Chicago M.S.F.A. Boiler Capacity Tables

Since the publication of the revised boiler capacity tables, compiled by the Chicago Master Steam Fitters' Association, a number of minor changes have been made. One of these is the key number for the Heggie Simplex boiler, which has been changed from Key 12 to Key 9. This gives the Heggie boiler a factor of 65% over the radiation load, instead of 40%.

American Society of Heating and Ventilating Engineers

Program for Midsummer Meeting

Following is the general schedule of events at the forthcoming meeting of the American Society of Heating and Ventilating Engineers, in Atlantic City, N. J., June 15-17, headquarters being at the Hotel Traymore:

MONDAY MORNING, JUNE 15

Registration.

Business session.

MONDAY AFTERNOON, JUNE 15

Research session.

MONDAY EVENING, JUNE 15

Testimonial Dinner to Dean F. Paul Anderson, followed by informal reception and dance.

TUESDAY MORNING, JUNE 16

Technical session.

TUESDAY AFTERNOON, JUNE 16

Special events, including golf for the men and luncheon and bridge for the ladies.

TUESDAY EVENING, JUNE 16

Entertainment at Steeplechase Pier.

WEDNESDAY MORNING, JUNE 17

Code session.

WEDNESDAY AFTERNOON, JUNE 17

Social events.

Paper: A Proposed Method for Comparison of Effectiveness of Indirect Heating Surfaces, by A. E. Stacey, Jr., and C. M. Ashley.

Paper: Effect of Length of Leader Pipe on Heating Capacity in Gravity Warm-Air Heating, by V. S. Day.

Paper: Allowance for Variations in Temperature at Register Faces for Design of Warm-Air Furnace Systems, by A. P. Kratz.

Paper: Value of Fans in Furnace Heating, by C. G. Buder.

In addition to the papers, one session will be devoted to the proposed "Code of Minimum Requirements for the Heating and Ventilation of Buildings." This session will in charge of Louis A. Harding, chairman of the committee which has been compiling this code. Another session will be devoted to research topics and will be conducted by W. H. Driscoll, chairman of the Committee on Research.

The entertainment features of the meeting will be in charge of a committee chosen from members of the New York and Philadelphia Chapters, under the direction of an executive committee, headed by Charles V. Haynes, and including R. C. Bolsinger, H. P. Gant, E. T. Murphy, W. J. Olvany, A. A. Adler, R. H. Carpenter, E. B. Johnson and F. C. Houghten.

New York Chapter Closes Season With Dinner

New York Chapter held its annual dinner and entertainment at the club rooms of the Building Trades Employers' Association, May 18. At a long table were the officers, while the ordinary members gathered around round tables, but the food was the same at both. Those at the round tables certainly had better opportunity to enjoy the entertainment provided by Engle's Entertainers, although some of the dancing performers reached the "speaker's table" at intervals. There were no speakers, that is, formal speakers, however, as the entire evening was one of informality.

Illinois Chapter's May Outing

The May outing of the Illinois Chapter, held on May 8, took the form of a golf meet at the Wilmette Country Club, Chicago, where 21 members of the chapter competed for prizes. The arrangements were in charge of Carl W. Johnson, of C. W. Johnson, Inc.

Western New York Chapter

A novel method for demonstrating Mercoid controls was presented by C. J. Swan, of the American Radiator Company, at last Spring meeting of the Western New York Chapter, which was held in Buffalo, May 4. A panel, mounting all of the necessary apparatus, formed the basis of the talk, which dealt with the operation of these temperature, pressure and vacuum controls for use with oil-burning, refrigerating, central heating, water-tank control, dry-kiln control and many other applications.

Other speakers were Charles V. Haynes, who outlined plans for the summer meeting at Atlantic City, and H. A. Fruauff, secretary of the Buffalo Chapter of the American Institute of Architects, who spoke on the proposed local zoning ordinance. Following this talk, the chapter passed a resolution in favor of adopting the ordinance, and urging the city council's early and favorable consideration of it.

The American Brass Company showed five reels of moving pictures entitled "Mine to Consumer," which told the story of its highly-developed industry.

The entertainment committee was instructed to formulate plans for a party or picnic for the members and their wives, to take place during June

Correspondence

Determining Air Capacities of Vacuum Pumps

EDITOR HEATING AND VENTILATING MAGAZINE:

The writer has gone over the letter and answer on the question of determining air capacity of vacuum pumps as given in the May issue of your journal, very carefully, and believes that the discussion given is rather more involved than is really necessary.

Steam pumping practice in the past has shown that satisfactory results are secured on any vacuum heating system when a capacity of approximately 8 G.P.M. per 1000 sq. ft. radiation is allowed. This will finally reduce itself to a basis of approximately ¾ cu. ft. of air capacity per minute per 1000 sq. ft. radiation, and from 1½ to 2 gal. of water capacity. It is good practice to be somewhat liberal on the water capacity, due to the fact of handling rather hot water under vacuum conditions.

There seems to be a lack of information available in current text books on this subject. However, the above-mentioned capacities will be found to give satisfactory results. Of course, if there is a large amount of Vento radiation on the installation, the air pump capacity should be based on the actual amount of radiation on the job, while the water pump capacity should be based on the equivalent direct radiation on the job.

R. H. ANDEREGG

Pump Department, The Trane Company
LaCrosse, Wis.

The Apprenticeship Situation in the Steam-Fitting Industry

EDITOR HEATING AND VENTILATING MAGAZINE:

I had the pleasure of reading the article on page 75 in your May issue of THE HEATING AND VENTILATING MAGAZINE headed "Heating and Piping Contractors—This is Your Job." The article refers to the question of steam fitters' apprentices.

I wish to compliment you on this article as it is a matter which I have been greatly interested in for many years and have given it much thought and time.

There was only one point that I wish to impress which is, that in a great many sections of the country the steam-fitting trade still consists of a steam-fitter and what is commonly termed a steam-fitter helper. Those who enjoy this manner of pairing up two men for this trade are fortunate. Everything should be done to continue the same. The fact remains that 90% of the work of a steam-fitter requires two men. This, however, should not eliminate every effort in attempting to educate and train the steam-fitter helper and they could rightfully do so under that term, instead of using the term "apprentice." This would then place the steam-fitter helper in a position of becoming a trained mechanic, would give him greater interest in his work and would help to make up the great shortage existing of good mechanics in the steam-fitting industry.

Your article mentions only 577 steam-fitter apprentices in school in 1923-24. If your figures are correct I am doubly surprised, because of the fact that we in Chicago had during the year 1924 387 apprentices, all attending school regularly. We at the present time have possibly nearer 400 apprentices. Final examinations take place at different periods of the year and a steam-fitter card is issued to the apprentice, if such examination is successful.

I take the liberty of enclosing a copy of the apprentice rules which may be of interest to you. These have been in force for the past seven years and a considerable number of apprentices have been made excellent mechanics.

GEORGE M. GETSCHOW

Chicago, Ill.

An Opportunity For Heating Engineers to Co-operate With Architects

Five years ago a group of architects in Minneapolis started to see if something could not be done to secure for the builders of small homes the same class of architectural service as is enjoyed by those desiring more elaborate and costly homes. As the outgrowth of this experiment, we find a firmly established organization known as The Architects' Small House Service Bureau, with headquarters in Minneapolis, and seven regional bureaus, doing even more than the sponsors hoped.

The bureau is controlled by the American Institute of Architects, and, from a beginning of sixteen sketches, has developed to a point where complete plans and specifications are available at nominal cost for over 300 homes of six rooms and less.

Bureau service is limited to the type and kind of house which the average architect seldom if ever can handle at any profit to himself. The bureau movement is not in competition with the architect. On the contrary, in every piece of literature, the home builder is urged to employ an architect for every job, however small. If, however, an architect is not available, the bureau fills the breach.

An editorial service to some 100 papers is furnished weekly, and a monthly bulletin is published. This is in the nature of a service bulletin rather than a magazine, and covers the period between the first inquiry and the completion of the house, a period of from 18 to 36 months.

It is now proposed to add to this service, data on the heating and ventilation of such homes, and the suggestion has been made that the heating and ventilating industry furnish this information as well as appoint representatives who could be called upon by the bureau to render expert advice on any given problem.

Gas Companies Developing Summer Load

One phase of the awakening activity of the gas companies throughout the country has to do with the development of a summer load that will offset the growing winter demand resulting from the increasing use of gas for residence heating.

It is a question of developing markets where they have not heretofore existed, and one line of low resistance seems to be the refrigeration of theatres and other public buildings and to limited extent, residences. There is, of course, the possibility of working out household refrigerator units operated by gas instead of electricity, but when it is realized that one theatre load might equal that imposed by all the ice-box units in a community, the load being mostly during the daylight hours, the possibilities of such wholesale connections become apparent.

The cooling effect of city gas is produced by absorbing ammonia in water, boiling off the ammonia as a gas, cooling the ammonia gas and allowing it to expand into the refrigeration coils. The expansion of the ammonia gas causes the cooling effect in the refrigerator. The ammonia is re-condensed and again goes through the same cycle. City gas comes into play when burned to evaporate the ammonia gas.

Chimneys and Flues in Building Codes

Adoption of uniform codes of minimum requirements for chimneys and flues were urged by D. Knickerbocker Boyd, in an address before the recent Building Officials Conference, in Madison, Wis.

Reference was made to the proposed "Ordinance for Construction of Chimneys," adopted last year by the conference, as being an excellent starting point, as it has already been adopted by twelve important national associations, with the exception of a table giving the "Minimum Chimney Flue Sizes and Heights Recommended for Furnaces and Low-Pressure Steam and Hot Water Boilers." This table was contained in the appendix to the ordinance (and published in THE HEATING AND

VENTILATING MAGAZINE for March, 1925) in which it was stated that "the American Institute of Architects and the American Society of Heating and Ventilating Engineers have withheld approval of this table on the grounds that it is not yet a sufficiently recognized standard to warrant its being accepted as a satisfactory guide in all cases."

Mr. Boyd then went on to outline the most common errors in chimney design and construction, stating that it was a matter of grave importance, inasmuch as here is a home fire every four minutes, the second greatest single hazard being defective flues. As almost 50% of the present construction in the country is residences, such losses involve tremendous aggregate amounts.

The common error, according to Mr. Boyd, is to make flues too small, especially where linings are put in, as the thickness of the lining is frequently not considered, nor is the reduction in effective area due to the rectangular shape of the flue regarded. The effective area of a rectangular flue is, roughly, only 85% of that of a circular flue of the same area, yet, due to ease of bricklaying, the rectangular flue is commonly used.

Another source of trouble comes from connecting more than one heating unit to a single flue, something that should, save in rare cases, be prohibited.

Mr. Boyd suggested that code requirements for outside chimneys calling for a minimum of 8 in. of brickwork would automatically result in more chimneys being built entirely within the house area, resulting in greater heating efficiency.

Oil Burners Newly Listed by Underwriters

Underwriters' Laboratories, Chicago, has issued a new listing of oil burners, as of May 12. The newcomers are as follows:

A. B. C. "Type E" Domestic Oil Burner. Automatic Burner Corporation, Chicago, Ill.

Mechanical draft oil burner with a.c. or d.c. electric motor drive. Temperature Control—Automatic. Ignition—Gas pilot. Fuel—Distillate not heavier than 32° A.P.I. Fuel Feed—Gravity from supply tank to constant-level chamber, and suction from constant level chamber to atomizing cup. Designed for hot-water, steam and warm-air installations.

Marking: "Type E" on etched name plate attached to resistance box cover.

Aetna "Type N" Domestic Oil Burner. Aetna Automatic Oil Burner, Inc., Providence, R. I.

Mechanical draft oil burner with a.c. electric motor drive. Temperature Control—Automatic. Ignition—Gas pilot. Fuel—Distillate of not heavier than 35° A.P.I. Fuel Feed—Suction from supply tank to pump, pressure from pump to combustion chamber. Designed for hot-water, steam and warm-air installations.

Marking: "Type N" on etched name plate attached to top of anti-flooding device chamber.

Caloroil "Model O" Domestic Oil Burners, ("Type A" previously listed). Caloroil Burner Corp., New York, N. Y.

Mechanical draft oil burners steam or air atomizing types. Temperature Control—Automatic. Ignition—Gas Pilot (Gas heated steam generator for starting). Fuel—Distillate or fuel oil not heavier than 28° A.P.I. Fuel Feed—From supply to float chamber by gravity and float chamber to burner by suction. Designed for hot-water, steam and warm-air installations.

Combustion "Type D" Domestic Oil Burner. Combustion Fuel Oil Burner Co., Milwaukee, Wis.

Mechanical draft oil burner with a.c. electric motor drive. Temperature Control—Automatic. Ignition—Gas pilot. Fuel—Distillate or fuel oil not heavier than 24° A.P.I. Fuel Feed—From special auxiliary supply tank to nozzle by pressure or less than 10 lb. per sq. in. Designed for hot-water, steam and warm-air installations.

Marking: "Type D" on name plate attached to compressor base plate.

Hardinge "Type U-L" Domestic Oil Burner. Hardinge Brothers, Inc., Chicago, Ill.

Mechanical draft oil burner with a.c. or d.c. electric motor drive. Temperature Control—Automatic or manual. Ignition—Manual or gas pilot. Fuel—Gravity feed burner, distillate not heavier than 34° A.P.I. Pump feed burner, fuel oil not heavier than 28° A.P.I. Fuel Feed—Gravity from supply tank to combustion chamber; or suction from supply tank to pump; pressure from pump to combustion chamber. Designed for hot-water, steam and warm-air installations.

Marking: "Type U-L" on etched name plate attached to burner base.

May "Type L" Domestic Oil Burner. May Oil Burner Corp., Flushing, N. Y.

Mechanical draft oil burner with a.c. or d.c. electric motor drive. Temperature Control—Automatic. Ignition—Electric. Fuel—Distillate not heavier than 36° A.P.I. Fuel Feed—Suction from supply tank to oil pump, mounted on burner. Designed for hot-water, steam and warm-air installations.

Marking: "Type L" on etched name plate attached to blower housing.

Oil-O-Matic "Model G" Domestic Oil Burner. C. U. Williams & Son Co., Bloomington, Ill.

Mechanical draft oil burner with a.c. or d.c. motor drive. Temperature Control—Automatic. Ignition—Gas pilot, electrically ignited. Fuel—Kerosene, distillate, gas oil or fuel oil not heavier than 28° A.P.I. Fuel Feed—Gravity or suction to metering pump, and pressure from pump to combustion chamber. Designed for hot-water, steam and warm-air installations.

Marking: "Model G" on etched name plate attached to blower housing.

The following are listed as industrial:

INDUSTRIAL

The oil burners listed as standard on the following cards may be permitted for use when installed in accordance with the regulations of the National Board of Fire Underwriters for the class, if not in violation of any state law or local ordinance, and if company insuring property consents in writing on its policy. Before an equipment is installed or before an existing equipment is remodeled, the plans should be submitted for approval to the Inspection Department having jurisdiction.

Burners classified as industrial are suitable for use where an attendant is constantly on the premises and are not usually provided with anti-flooding devices for automatically shutting off the oil supply to the burner in the event of flooding or extinguishment of the flame. Burners of this class are usually intended for industrial installations, but where permitted, may be used for heating apartment houses and the like, not ordinarily classed as industrial applications. Such burners of this class as are provided with anti-flooding devices are so marked on the individual cards. As industrial burners having single pumps may be permitted under certain conditions, distinction is made on the cards between those burners having single and those having duplicate pumps.

Electrical features which are a part of the equipments listed, have been reviewed. Installation of electrical equipment should be made in accordance with the requirements of the National Electrical Code.

Fire.—Re-examination Service.

Ballard "Type H" Industrial Oil Burner System. Ballard Oil Burning Equipment Co., Boston, Mass.

Mechanical draft air atomizing oil burner system, consisting essentially of pump set, burner, heaters, relief valve, remote control switch, electrical control cabinet and tank gauge. Temperature Control—Manual (anti-flooding device not provided.) Ignition—Manual. Fuel—Fuel oil not heavier than 12° A.P.I., pre-heated when necessary. Fuel Feed—From supply by suction to pump and from pump to burner under pressure. Designed for hot-water and steam installations (duplicate pumps provided).

Marking: "Type H" on brass master plate attached to base of pump set and appearing on each unit of system mentioned above.

Hardinge "Type U-L" Industrial Oil Burner. Hardinge Brothers, Inc., Chicago, Ill.

Mechanical draft oil burner with a.c. or d.c. electric motor drive. Temperature Control—Manual. (Anti-flooding device provided). Ignition—Manual. Fuel—Fuel oil not heavier than 24° A.P.I. Fuel Feed—Suction from supply tank to pump, pressure from pump to combustion chamber. Designed for industrial steam and hot-water installations where burners having single pumps are permitted.

Marking: "Type U-L" on etched name plate attached to burner base.

Johnson "Type 22" Rotary Industrial Oil Burner. S. T. Johnson Co., San Francisco, Calif.

Mechanical draft oil burner with electric motor drive. Temperature Control—Manual. (Anti-flooding device not provided). Ignition—Manual. Fuel—Fuel oil of 24 to 36° A.P.I. Fuel Feed—Suction from supply tank to pump mounted on burner. Designed for steam and hot-water installations where burners with single pumps are permitted.

Marking: "Type 22" on name plate attached to rear of blower housing.

Legal Decisions

Heating Service May or May Not Be a Public Service—Right to Discontinue Service

Complaint was made against the discontinuance of heating service formerly furnished by an electric utility to the complainants, who owned four properties in a block in Petersburg, Ill. The Central Illinois Public Service Company purchased the property in 1923, and at that time the order of the Illinois Commerce Commission, authorizing the purchase of the property, by its terms specifically limited the purchase to electric utility property, and that part of the order granting a certificate of convenience and necessity to the company to operate in the city of Petersburg was limited to "electric utility business." No authorization was ever procured by the company to transact a heating utility business in the city, and the evidence clearly disclosed that at the time of the purchase nothing by way of heating utility property was contemplated by either seller or purchaser, or in any way included in the transfer.

It appeared from the evidence that such heat as had been furnished by the respective owners of the electric generating plant at Petersburg had been limited to the four properties in question, and that in each instance it was commenced and had been carried on as a matter of private contract between the respective owners of these properties and the owners of the plant; that all facilities and apparatus for conducting heat were supplied and owned by the respective owners of the four properties, including all mains, valves, etc., outside of the plant itself; and that there had at no time been any offer to furnish heat to the public generally, but on the contrary direct and specific refusals to furnish heat even to other property located in the same half of the block on which the plant is situated.

The Illinois Commerce Commission holds that its jurisdiction is by law limited to public utilities, and to constitute a "public utility" within the meaning of the law it is necessary that a "public" service be rendered. There must be a delivery or a holding out for delivery of a product, commodity or service to all persons, without discrimination, who desire and will pay for it. "Public" use, in the sense that those furnishing the thing used can be said to be conducting a public utility, means a use to which every individual member of the public, willing to pay for it, is entitled as a legal right.

The mere fact that one furnishes a commodity, product or service which may be, or commonly is, furnished by a public utility, does not constitute one a public utility, if in fact the commodity, product or service be furnished by private contract.

Neither does the fact that a company may be a public utility as to electric service tend in any way to constitute it a public utility as to other commodities, products or service in which it may deal by private contract. Even as to the same service a company may as to one class of customers be a public utility, and as to another a private corporation not subject to regulation.

The commission cited various authorities to the above effect, and applying these authorities to the evidence in the case, it held that the heating service was not a public service, and that in furnishing the same neither the company nor its predecessors were acting in the capacity of public utilities.

The complaint was therefore dismissed.

Patent for Vacuum Steam Heating System Held Valid But Not Infringed

The federal district court for Massachusetts holds, Nash Engineering Co. v. W. D. Cashin & Co., 3 F (2d) 686, that the Jennings reissue patent, No. 15,637 (original No. 1,447,854) for a vacuum steam heating system is valid, but not infringed by the defendant. "The defendant does not use an air pump to exhaust the air from the receiver. In his apparatus the air mixed with water is pumped into the receiver, and thence escapes into the atmosphere. Whatever may be the scope of the plaintiff's patent, which need not here be determined, it does not cover the defendant's apparatus. The idea at the base of Jennings' invention was to exhaust the air from the tank; it is limited to an apparatus which will accomplish this function as the essential feature of its operation."

Elsewhere the court says: "The present case clearly illustrates the rule of laws that, when a patent describes an invention of a particular kind, without any indication in the specification that the invention covers a wider field, it cannot be interpreted so as to cover this wider field, since those skilled in the art would not be apprised by the patent that the apparatus therein described and claimed, or one similar to it, could be so used."

Exposition of Architecture and Allied Arts

Heating and ventilating apparatus constituted a prominent section of the exhibits at the Exposition of Architecture and Allied Arts, held in Grand Central Palace, New York, April 20 to May. 2. Among the exhibitors were the following:

American Radiator Co., New York, occupying three booths, showing the Type A heat machine, gas-fired boilers and the new Corto radiator. This was one of the most attractive exhibits at the exposition, and showed the high state of development to which this company has brought its products.

Jenkins Bros., New York, showed a large number of different types of valves.

Johns-Manville, Inc., New York, displayed products of asbestos, particularly as developed for heat-insulating uses.

Monarch Metal Products Co., St. Louis, Mo., had a demonstration of the relative infiltration of air through windows with and without window strips.

Spencer Turbine Co., Hartford, Conn., showed central vacuum cleaning systems.

Kelsey Heating Co., Syracuse, N. Y., exhibited a warm-air furnace.

Richardson & Boynton Co., New York, displayed gas ranges and round and sectional heating boilers.

Minneapolis Heat Regulator Co., Minneapolis, fitted up their booth as an attractive living room and showed a thermostatic control operating to maintain uniform temperature.

United States Radiator Corp., Detroit, showed boilers and radiators in an attractive booth.

Ever Hot Heater Co., Detroit, exhibited a storage gas water heater.

B. F. Sturtevant Co., Boston, exhibited air-washing equipment and different types of blowers.

Walworth Mfg. Co., Boston, showed Watts regulators, relief valves, etc., and a Stack Indirect heater.

Warren Webster & Co., Camden, N. J., demonstrated the Webster system of steam heating, with special modulating valves and other equipment so fashioned with glass tubes and plates that the operation could be observed.

Gillis & Geoghegan, New York, showed a pneumatic tube system and cellar hoisting machinery.

Chamberlin Metal Weather Strip Co., Detroit, Mich., demonstrated the efficiency of its products by means of a testing outfit equipped with a full-sized window. Wind effects were secured by means of an electric fan, an an ingenious arrangement for measuring the air flow consisted of a large gas meter, furnishing direct readings similar to gas readings. The exhibit was in charge of H. W. Whitten.

THE STATE OF BUSINESS

Spring Business Below Expectations

Logical Evolution of Market Will Bring Automatic Solution

Especially Prepared for THE HEATING AND VENTILATING MAGAZINE

By *L. W. Alwyn Schmidt*

AFTER the economic unrest of the last few months, signs of a near improvement are now appearing. True, such signs are still hardly noticeable and a downard trend, in fact, is reported in many industries, but in their accumulation they have nevertheless been of sufficient strength to exert a steadying influence upon the market. As the result, the economic situation looks today more hopeful than it has looked for many months.

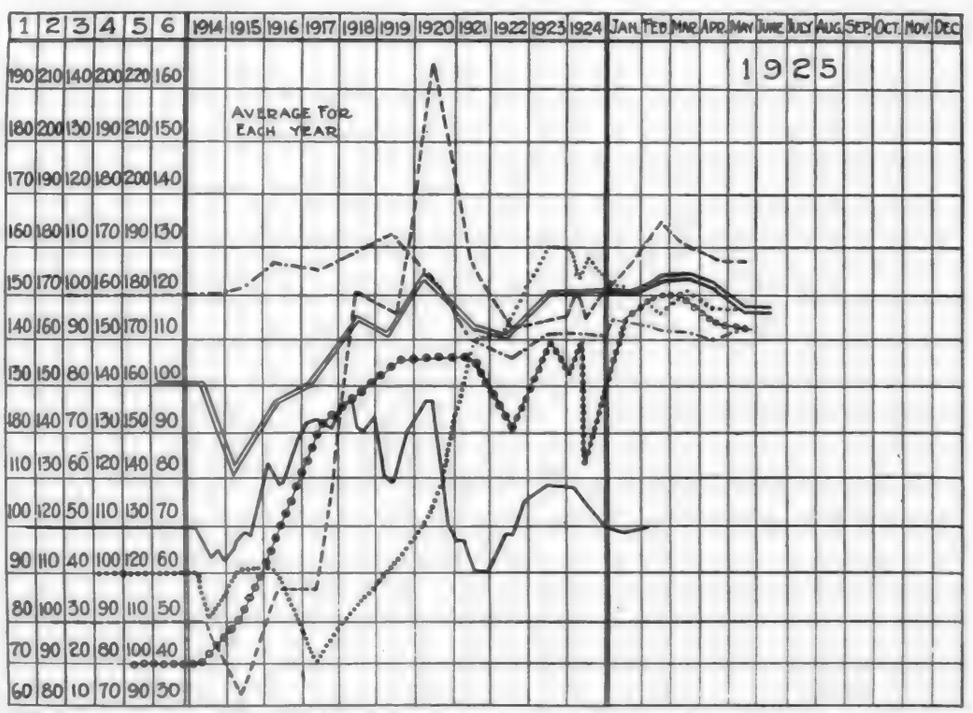
The American nation ranks among the leading industrial producers of the world. But while its factories are turning out merchandise at an enormous rate its industries rely upon a market, practically 60% of which is agricultural or at least semi-agricultural in character. Being almost in the sole possession of its market, American industry has equipped itself to supply its varying needs, showing little or no inclination to export upon a large scale.

Theoretically, the possession of this market should be very advantageous. The enjoyment of this very satisfactory arrangement, however, is somewhat impaired by the fact that the agricultural section of the market depends upon foreign markets for its prosperity and resulting purchasing strength upon the disposal of its surplus production. Anything disturbing the consumptive capacity of the foreign customer of the American farmer, in consequence, is bound to reflect upon American Industry.

We have, therefore, the peculiar situation of a large industry having no export to speak of, being dependent, nevertheless, for its sales upon a consumer who must export to be a customer. This feature of our economic situation cannot be sufficiently emphasized; it is responsible for many of the contradictory developments in our own market and it must be kept continually in sight when an attempt is made to forecast the future development of the American market.

If, nevertheless, hope is to be drawn from the present economic situation, it is to be found in the good news from Europe, where the stabilization of the national currencies is progressing very satisfactorily and where, in consequence, a new and sound market is building for American farm products. It is now certain that the European consumer will help to draw off the surplus production from our Western farms and by doing so provide that little extra cash that is required to bring contentment and spending power to the American farmer.

Under these circumstances we do not need be unduly alarmed about the reduction in the industrial employment ratio and the lowering of wages in many branches of the national industry. These are sufficiently balanced by price



Analysis of Business Conditions at End of May

reductions in life's necessities, and the national purchasing power, which has shown a decline during the last months, is showing signs of returning steadiness, with every indication for a slow upward movement in the near future. The combined purchasing power of the farmer and the industrial wage earner in this manner should provide a satisfactory outlet for the products of our industry.

It is this eventuality which our manufacturers will have to bear in mind when laying their plans for the Summer and Autumn. Just now they are marking time, waiting for a decisive cue pointing the direction in which the market will turn.

As it is, the industry is well prepared to withstand the unavoidable stress of a situation like the present. Three months of careful husbanding of all financial resources have improved the credit situation materially. There is a greater liquidation of accounts and the market has freed itself of undesirable ballast. Stocks of merchandise are low and the retailers are ready to take care of any improvement in the market on the first reliable indication.

Manufacturing costs which have been rather high in many industries in the early part of the year have undergone a downward adjustment, bringing in turn a slight increase in the industrial profit margin. This, in part, at least, has been applied to strengthen the financial reserves of the industry and provide the necessary means for expansion, should this become necessary at the end of the Summer.

The building industry has acquired new activity with the return of warmer weather but the steel mills are complaining about a slowing up in demand.

It would be a mistake, however, to appraise the chances of the future development of the market entirely upon the basis of a present showing. The weather, a deferred buying movement, the European recovery are at the best only incidents in a bigger development, moving not as the result of seasonal fluctuations, but upon large periods of ascent and decline. And, judged from this wider point of view, the market appears to collect force for a new upward movement. The principal reasons in favor of this theory are:

1. There has been no expansion of industrial production since 1922.

2. During the same period the market has grown in number of consumers' financial resources, expectation of comfort.

3. The period of monetary and economic adjustment has come to an end and a new balance is near.

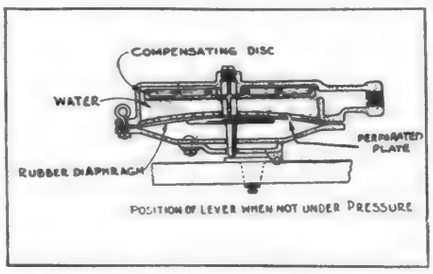
These three forces must come to the surface of the market soon. They cannot fail to bring its pressure upon the economic life of the nation, creating a strong purchase movement upon an industry equipped only to handle a normal demand.

New Apparatus and Appliances

New Hoffman Damper Regulator

Announcement has been made by The Hoffman Specialty Company, Inc., 25 West 45th Street, New York, of a new improved damper regulator, designed by George D. Hoffman, president of the company, for use on any type of low-pressure boiler.

One of the most important features of this damper regulator is such accurate control of the dampers that only sufficient pressure is maintained to insure circulation to all radiators. It is designed to be extremely sensitive in its action and to accomplish this control so effectively that when inlet valves



Section of New Hoffman Damper Regulator

are turned off or on, the fire will be accelerated or retarded to meet the change in demand for vapor. A constant pressure is therefore maintained so that immediately a valve is turned on, vapor enters the radiator.

The new damper regulator has one feature that will be appreciated by the installing steam fitter, in that the fulcrum on which the lever is suspended may be turned at different angles, permitting a straight chain connection with the dampers, instead of at an angle, which might cause the damper to bind.

To obtain the maximum degree of sensitiveness in a regulator it is essential that the diaphragm be extremely flexible. To obtain this desired flexibility, rubber diaphragms are used in preference to metal diaphragms, care being taken to keep them continually submerged in water to prevent vulcanization. In the Hoffman damper regulator the water is always held on the upper portion of the diaphragm. This diaphragm is 11 in. in diameter free area. A compensating plate is placed directly above the diaphragm and so arranged that when the diaphragm moves into its extended position, the plate follows it and prevents water from occupying the space below the inlet left vacant by the downward diaphragm movement. The action of the regulator is, therefore, equally sensitive in opening the drafts as it is in closing them.

The pressure in the boiler moves the diaphragm down and the weight on the lever moves it up. Shifting the weights on lever arm changes its range of operation from atmospheric-pressure upward in ounces to any pressure desired to operate the draft of a low-pressure heating boiler from 0 up to 15 lbs. pressure.

A New Unit Gas Heater

An ingenious unit gas heater for use where small volumes are to be heated, has been so simplified that it may be operated entirely from a push-button control placed where convenient. The heater, which is furnished to its customers by the Peoples Gas Light & Coke Company, of Chicago, is of conventional type, and is installed in the basement, with one or two pipes to floor or wall registers. The control is a small four-button switch, with buttons marked: "on," "off," "high" and "low." These

Push-Button Controlled Unit Gas Heater

buttons operate switches that control a solenoid switch placed in the gas line, by means of which the gas to the heater is controlled. Current for operating the switch is taken from the house lighting mains through a small transformer, and reduced to 8 volts, practically removing any risk through short-circuiting of the wires. In sections, notably around Chicago, and where gas is coming into use for residential heating, these small unit heaters are finding a ready sale.

New Clarage Fan Shows High Efficiency Over Wide Range

The new type "HV" fan, recently brought out by the Clarage Fan Company, Kalamazoo, Mich., shows high efficiency over a wide range, according to data contained in the company's new catalog, Reference Book No. 53.

Reaching a maximum efficiency of 81½% at 100% air delivery in the double-inlet fan, and 77% efficiency in the single-inlet type at the same point, the efficiency curve holds up to a remarkable degree over increased outputs.

For example, considering the double-inlet type, the fan is shown to be above 80% efficiency from 78% to 112% of its rated delivery. It is above 75% efficiency from 63% to 131% of its rated load, and above 70% throughout the range from 53% to 145% load. The single-inlet type shows the same characteristics, being better than 75% efficient between 80% and 115% load, and above 70% from 70% to 132% capacity.

This fan is the result of much experimental work, and it is stated that the results obtained are the result of careful co-ordination of the several elements contributing to high efficiency. The fan is tested at tip speeds of 6000 ft. per minute, and, at working speeds is said to be practically noiseless.

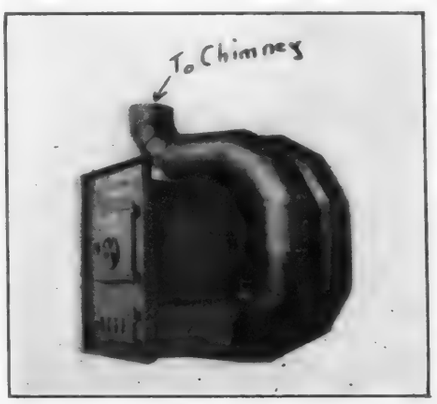
The details of desigr have been carefully worked out, with the intention of reducing the maintenance to a minimum. To this end provision has been made to keep dust from the bearings, and to insure positive lubrication.

The catalog covers a wide range in capacities, direct-motor-driven, steam-driven and belt-driven types. Full data are given, and many assembly and detail views.

Novel Type of Warm-Air Furnace

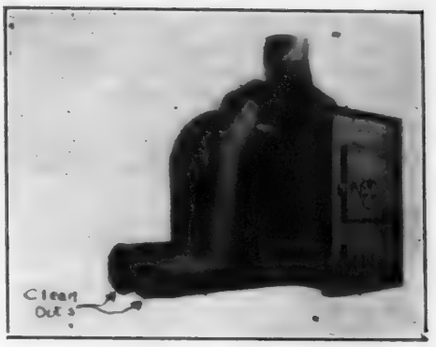
Alfred Johnson, of Spokane, Wash., has obtained patents covering a new type of warm-air furnace for which high thermal efficiency is claimed.

The feature of the furnace consists of a flue pipe, taking off from the top of the dome, passing twice around the fire box, inside of the casing, and terminating in a smoke lead to the chimney. With a fire box of 5½ sq. ft. area,



Johnson Furnace Showing Arrangement of Flue Pipe

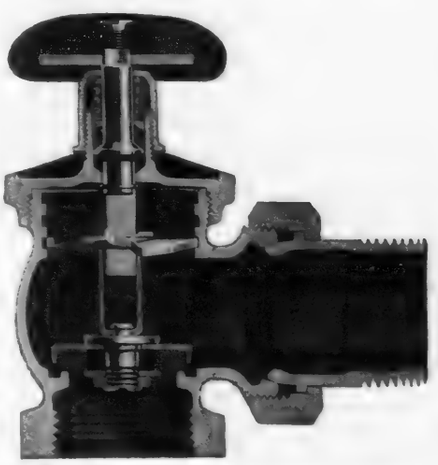
the total radiation area from the fire box and coil is over 72 sq. ft. This size furnace measures 4 x 4 x 4 ft., and may be enclosed in either a round or square casing. The fire-box is an electrically-welded boiler-plate job.



Johnson Furnace Showing Clean-Outs

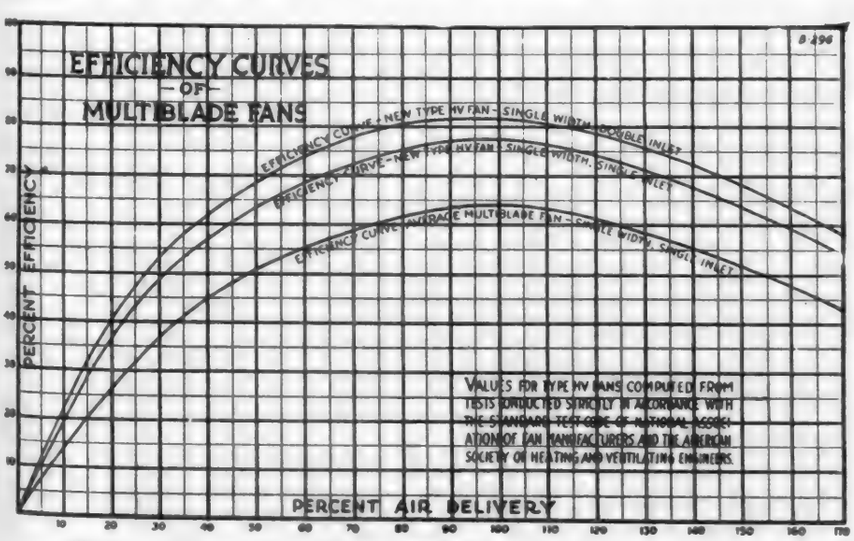
The Arco Packless Radiator Valve

A noteworthy addition to the present types of packless valves has been made by the American Radiator Co., Buffalo, N. Y., in the announcement of the new Arco packless radiator valve which has just been placed upon the market. This valve has been designed with special reference to preventing leaks of steam or water around the stem. Another important feature of the valve is its quick opening and closing design. The valve may be opened or closed with one smooth turn, without any loss in tightness for preventing seepage of steam or water into the radiator. An additional feature pointed out by the manufacturer is the moderate cost of the valve due to the company's long experience in valve manufacture and in its equipment for quantity production.



New Arco Packless Radiator Valve

All interior parts of the valve are of brass while heavy brass stampings are used in the moving parts to insure exact uniformity. On special order these valves can be furnished for forced water systems for pressures up to 50 lbs. They are supplied with either round or lever handles. The valve is also furnished in the fractional type. This is similar to the steam type, differing in the handle and dial equipment and the calibrating cone on the disc.

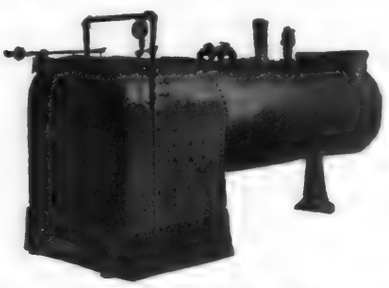

EFFICIENCY CURVES
-OF-
MULTIBLADE FANS
B 496
EFFICIENCY CURVE - NEW TYPE HV FAN - SINGLE WIDTH, DOUBLE INLET
EFFICIENCY CURVE - NEW TYPE HV FAN - SINGLE WIDTH, SINGLE INLET
EFFICIENCY CURVE - AVERAGE MULTIBLADE FAN - SINGLE WIDTH, SINGLE INLET
VALUES FOR TYPE HV FANS COMPUTED FROM TESTS CONDUCTED STRICTLY IN ACCORDANCE WITH THE STANDARD TEST CODE OF NATIONAL ASSOCIATION OF FAN MANUFACTURERS AND THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
PERCENT EFFICIENCY
PERCENT AIR DELIVERY

Efficiency Curves, New Clarage "HV" Type Fan Showing Wide Range Over Which High Efficiency is Secured

In a circular just issued by the company devoted to the Arco packless radiator valves, list prices are included, as well as roughing-in dimensions.

A Kewanee Boiler for House Service

To meet the growing demand the Kewanee Boiler Company, Kewanee, Ill., has decided to resume the manufacture



Kewanee No. 0 Type K Fire-Box Boiler

of the No. 0 Type K, Kewanee fire-box boiler which is particularly adapted for use in small buildings where the heating load does not exceed 600 sq. ft. of steam radiation. This little boiler is designed to fill the need for a steel fire-box type boiler built on the lines of the large riveted steel heating boilers for larger buildings. The firing door is of ample size for convenience in shovelling coal without any special skill and is so located that the tubes can be cleaned from the front. Following is an outline of the specifications:

Capacity, steam.....	600 sq. ft.
Capacity, water	1000 sq. ft.
Diameter of boiler.....	24 in.
Over-all length	93 in.
Length of fire-box.....	26 in.
Width of fire-box.....	19 in.
Height of fire-box	30 in.
Height of water line...	45 in.
Over-all height	51 in.
Size of tubes.....	3 in.
Size of steam opening..	3 in.
Weight	2550 lbs.

Help! Let's Stop the Nixies!

One million, seven hundred thousand dollars a year is what it costs the Post Office Department, and ultimately you, for nixies. What is a nixy? It is simply a piece of mail so carelessly addressed that it has to be removed from the regular "flow" of the postal service, for "directory service" or "hospital service." If the highly-trained nixy artists in the post-office service are able to correct the address, or decipher it, so that it finally reaches the addressee, or, failing that, through a return address, is returned to the sender, the government is set back, in the aggregate, nearly $2,000,000 per annum. If, however, it is impossible to forward the letter, either to addressee or sender, it becomes a "dead letter," and adds further to the cost of handling.

Postmaster New has inaugurated a campaign to eliminate, to the last degree, nixies. During the month of June many agencies, including the moving-picture, the press and civic organizations, will do their part to help the movement along. The following, then, is worth your consideration:

DO YOU KNOW?

THAT 21,000,000 letters went to the Dead Letter Office last year?
THAT 803,000 parcels did likewise?
THAT 100,000 letters go into the mail yearly in perfectly blank envelopes?
THAT $55,000.00 in cash is removed annually from misdirected envelopes?
THAT $12,000.00 in postage stamps is found in similar fashion?
THAT $3,000,000.00 in checks, drafts and money orders never reached intended owners?
THAT Uncle Sam collects $92,000.00 a year in postage for the return of mail sent to the Dead Letter Office?
THAT is costs Uncle Sam $1,740,000 yearly to look up addresses on misdirected mail?
THAT 200,000,000 letters are given this service, and—
THAT it costs in one city alone $500.00 daily?

AND DO YOU KNOW?

THAT this vast sum could be saved and the Dead Letter Office abolished if each piece of mail carried a return address, and if each parcel were wrapped in stout paper and tied with strong cord?
MORAL:—Every man knows his own address if not that of his correspondent.

PUT IT IN THE UPPER LEFT HAND CORNER!

New Publications

ENGINEERING FOUNDATION REPORT FOR 1924, (Publication No. 10) has been issued by the Foundation, as of April, 1925. The report contains portraits of the presidents of the founder societies, a statement of the origin and functions of the foundation, reviews of the activities of the past ten years, and, in detail, of the past year, together with reports on progress along the various lines of research fostered. A financial statement, lists of officers and members and of publications concludes the report. Size 7 x 10 in. Pp. 32.

TEMPERATURE OF WATER AVAILABLE FOR INDUSTRIAL USE IN THE UNITED STATES (Water Supply Paper 520-F), by W. D. Collins, has been issued by the United States Geological Survey. After describing the sources of information and the methods of analysis the author summarizes by stating that "the temperature of ground water available for industrial supplies is generally from 2° to 3° F. above the mean annual air temperature if the water is between 30 and 60 ft. below the surface of the ground. At a depth of 10 ft. the temperature may range from 10° above to 10° below the mean annual temperature. An approximate average for the increase in temperature with depth is about 1° F. for each 64 feet.

The mean monthly temperature of a surface water at any place is generally within a few degrees of the mean monthly air temperature when the air temperature is above the freezing point. The maximum water temperature in any of the warmer months is usually from 2° to 6° higher than the mean monthly water temperature. The publication contains two isothermal maps and several graphs. It is available from the Government Printing Office, Washington, D. C. Size 5¾ x 9 in. Pp. 12.

HOUSE HEATING, by Margaret Fishenden, is an English publication, the author being an investigator for the Department of Scientific and Industrial Research, a woman, who has brought together a great deal of interesting information, largely of an historical and scientific character. Practice in English house heating, as indicated by this book, is largely a question of drawing room grates and tea urns. We find almost nothing in the volume that treats of what in this country we call house heating. Out of nearly 300 pages, there is but one scant chapter of twelve pages devoted to "The Development of Central Heating." From this we would gather that house heating as we know it is simply not practised in England. Miss Fishenden has gathered together much interesting information on radiant heat emission, particularly as applied to grates and incandescent gas heaters, both of which are used but little in the United States. In contrast to the above-mentioned chapter on house heating installations, there are double that number in a chapter on "The Development of the Kitchen Range," which again indicates how wide the variation is between English and American heating practice. Size 7½ x 10 in. Pp. 296. Price $6.00 Published by H. F. and G. Witherby, 326 High Holborn, London, W.C. 1.

MEDICAL AND SANITARY INSPECTION OF SCHOOLS, by S. W. Newmayer, M.D., covers practically every phase of school hygiene, from the administrative to the detailed duties of the various public agents entrusted with this important work. Twenty-four years' of practice, as chief of Division of Child Hygiene and supervisor of school medical Inspection, Philadelphia, on the part of the author qualifies him to speak from experience, and he has gathered and skillfully woven together a great amount of pertinent and modern data; the chapters on school diseases and physical defects are exceptionally complete. A brief, but entirely up-to-date, section treats on heating and ventilation of school buildings, and, in spite of brevity, the author gives a comprehensive out-

line of ventilation requirements, humidity, preparation of air and heating. The Synthetic Air Chart is included in the illustrations, with such a story of its use that any layman can grasp its significance. The book is copiously illustrated with drawings, photographs, and several color plates. Size 5½ x 8 in. Pp. 462. Price $4.00. Published by Lea & Febiger, South Washington Square, Philadelphia.

HEATING AND HOT WATER WORK, by F. W. Dye, is an interesting book by an English authority, with such a wealth of practical experience behind him that his writing should appeal to the artisan, as well as to the engineer and scientist. The thought that struck the reviewer was the apparently wide divergence both in practice and in nomenclature between the British Isles and the United States. The book devotes practically one-half of its space to a discussion of systems of hot water supply, outlining, with many illustrations, the best methods and the common errors in installation. "Central Heating Work," which to the American mind would cover the heating of groups of buildings from unit stations, to the Britisher means ordinarily the heating of his home from a central heating unit rather than by stoves or fireplaces, which, one is led to believe, remain the almost universal method of domestic heating. And only 30 pages of the book deal with this subject. Later on, after discussing the heating of bath water from the "central" heating plant, and the details of gas boilers, which apparently only supply water for bathing and cooking, the author devotes 20 pages to a contemplation of "Gas-Heated Tea-Making Boilers." Curious, what a difference between us cousins in the manner of living. Would it appeal to the British business man to have a five-ton Mack drive up to his home and discharge 1,000 gal. of oil into an underground tank, said oil to maintain his home at a uniform temperature of 70°, through all the fog and cold of an English winter? Or, instead of using gas-fired tea boilers, how would our cousins feel about heating their homes with gas, with practically never a thought of the heating question during the heating season. Size 5 x 7½ in. Pp. 192. Price $3.00. Published by Spon & Chamberlain, 120 Liberty Street, New York, or can be had through the book department of THE HEATING AND VENTILATING MAGAZINE.

COKE AS A HOUSEHOLD FUEL IN CENTRAL CANADA is a voluminous report of the Dominion Fuel Board, which has just concluded a comprehensive survey of the domestic fuel problem in the Province of Ontario and the western part of the Province of Quebec. This area is known as the "Acute Fuel Area," because, carrying a large portion of the industrial burden of the dominion, it is forced to seek its fuel in the United States or Nova Scotia, both of which sources are precarious at times. The preliminary investigations of the board having indicated that the solution might lie in the development of the use of by-product coke, produced from the Nova Scotia bituminous fuels, the services of J. L. Landt, an engineer of long experience in the coking industry, were secured, and he was instructed to study this phase of the problem.

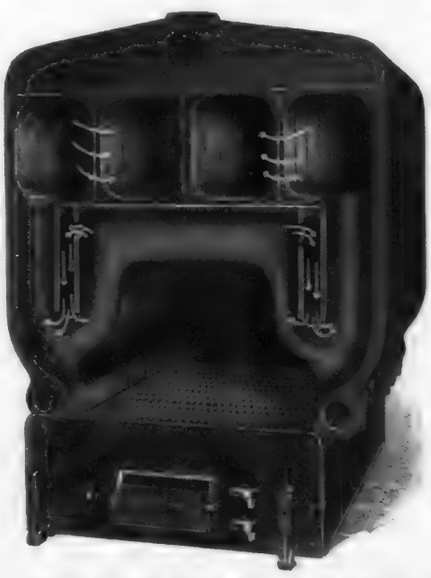
The report appears to entirely justify the preliminary findings of the board, and the following conclusions are presented:

"From a commercial standpoint, there is no question that by-product coking plants can be successfully introduced into Canada. Markets, with the exception of gas, exist in far greater extent than can possibly be supplied. Therefore, it becomes evident that as both gas and coke are in steady demand for domestic purposes, the industry will be almost free, if not entirely so, from fluctuations in business due to industrial depressions.

"The development of hydro-power in Ontario and Quebec has progressed by leaps and bounds in the past few years, but in Ontario the end of this development is, in certain sections, in sight. Even the completion of the St. Lawrence power and canal project will not afford Ontario sufficient waterpower. A further demand for power will necessitate the erection of steam plants. A possible solution of the fuel problem lies in this situation. A large coking plant, strategically located with respect to the steam-electric plant, could sell gas to such a plant to produce cheap power. If a coke-oven plant were built of sufficient capacity to satisfy the gas requirements of a 100,000 h.p. steam-electric plant, the amount of domestic coke made available would be ample to solve the domestic fuel problem of Ontario. Furthermore, the situation is such that an immediate solution would be probable—at most within the next five years. Cooperation in such a development would result in the elimination of the fuel problem that now confronts the 'Acute Fuel Area.'"

New Trade Publications

MERIDIAN SYSTEM OF SMOKELESS COMBUSTION is described in a booklet, received from the Meridian Boiler Co., Cincinnati, O. The boiler is of the cast-iron sectional horizontal type. There is nothing radically new or untried in any of the basic principles of the design or construction, except that the sections are so designed that, when assembled, a series of vertical flues is formed between them, leading to horizontal flues above the fire, thence to the stack. The secondary air passage extends along the fire chamber and is arranged with inlet opening from the combustion chamber and companion outlet openings at the base of the vertical flues leading from the combustion chamber. Secondary air, added through the front of the boiler, is mixed with the hot gases drawn from the top of the combustion chamber. This latter is rich in unconsumed carbon, and the mixture is fed through the lower outlet openings, close over the glowing coals of the fire, providing means for consuming fuel that would otherwise be lost. It is pointed out that, functioning in this way, the boiler operates at high efficiency, and that, except at firing periods, the smoke is almost entirely consumed. Furthermore, the burning of excess carbon in the combustion chamber decreases the accumulation of soot on the indirect heating surfaces. The catalog lists boilers rated from 4500 to 10,000 sq. ft. of steam radiation, with corresponding ratings for hot water. Size 6 x 9 in. Pp. 8.



Meridian Up-Draft Smokeless Boiler

WEATHER VEIN No. 2, the periodical of the Carrier Engineering Corp., Newark, N. J., tells an interesting story of the part played in the manufacture of cigars by air conditioning apparatus, which has become an essential part of the equipment of nearly all of the institutions of any size. Several of the largest cigar factories in the world, it is pointed out, are Carrier equipped.

GILT EDGE BOILERS, manufactured by R. J. Schwab & Sons Co., Milwaukee

Wis., are described in a recent catalog. These are of the round sectional cast-iron type, with a maximum heating surface and gas travel, sturdy construction, rated from 325 to 1275 sq. ft. radiation of steam, with corresponding hot water sizes. Size 6 x 9 in. Pp. 32.

ARMORAK SECTIONAL COVERINGS for piping is the title of a loose-leaf folder issued by Robert A. Keasbey Co., New York. The folder describes the construction of the coverings, which are made of successive layers of hair felt and waterproof paper. The design provides for many air-tight baffles, and the unit coverings, 3 ft. in length, are cut lengthwise, on one side only, so that, when applied, a maximum insulation results. The sections are covered with heavy armor, all joints are sealed, and a non-corrosive band is used as a final fitting. Special fittings are provided for tees and elbows. A chart is given which, together with tabular data, shows the low thermal losses through Armorak coverings.

GORTON SINGLE-PIPE VAPOR HEATING SYSTEM, the product of Gorton & Lidgerwood Co., 95 Liberty St., New York, is described in loose-leaf form, conforming to and punched for the standard of the Trade Extension Bureau.

COLUMBIA SAFETY SASH is described in a folder issued by Columbia Safety Sash Co., Inc., New York. This sash is designed to hang in the same way as the regular double-hung sash, but, for cleaning or ventilating, may be swung into the room. It is claimed that the window is practically air tight.

MONITOR BI-LOOP BOILERS AND RADIATORS are covered in a comprehensive catalog issued by the Monitor Bi-Loop Radiator Co., Lancaster, Pa. In addition to a line of U-Tube steel boilers, rating from 900 sq. ft. to over 8,000 sq. ft., the company features the modulated hot water system, in which the radiator is maintained about 95% full of hot water, the top portion, and one vertical column being filled with steam. Circulation of the hot water throughout the radiator is effected, it is stated, without noise, and with a high efficiency. The catalog contains illustrations of typical installations, together with data on boilers, radiators and fittings. Size 8½ x 11 in. Pp. 42.

THE THERMOSTAT, published by the Powers Regulator Co., Chicago, carries, as its leading article, "Hot Water Control." There is also an article on temperature control in the Manz printing plant, together with other information of interest to the organizaion and its clients.

DURIRON is the subject of Bulletin 141, published by the Duriron Co., Dayton, O. This bulletin, in addition to calling attention to the resistive qualities of this metal, describes Duriron chemical-proof exhaust fans, for use where iron and other metals would not stand the fumes. Capacity tables and full data on these fans are included.

FUEL COST RATING CHART, prepared by Better Building Registry, is being distributed by Sall Mountain Co., Chicago. This chart is designed to show fuel losses resulting from the use of uncovered or only partially insulated steam pipe, and has been developed from data secured largely from the Mellon Institute and the Research Laboratory in Pittsburgh. It is cleverly worked out to show graphically the losses for several types of insulation.

NATIONAL BULLETIN, issued by the National Tube Co., Pittsburgh, is a comprehensive story of the manufacture of iron pipe, with many photographs, showing the steps from the pile of iron ore to the tests of the finished product. Included are many tables, diagrams and specifications. Size 8½ x 11 in. Pp. 52.

RADIATOR CABINETS are described in a little folder, received from the Winchester Radiator Cabinet Co., Chicago. These cabinets not only add to the attractiveness of the house, but, equipped with humidifiers.

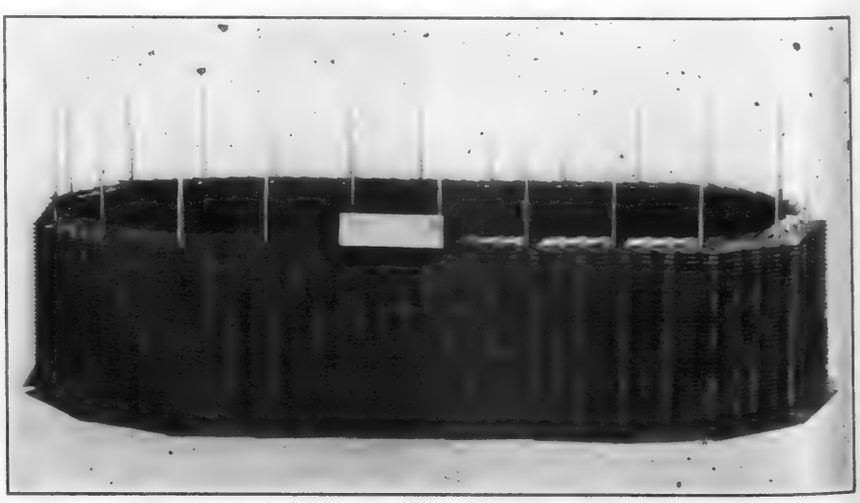
PHOENIX CONSTANT-EFFECT AIR FILTER is described in a recent catalog, issued by Drying Systems, Inc., Chicago. This filter is of the viscous-film type, but, in contrast to the types of cell filters, the cleaning effects of which diminish with use, the Phoenix is of a highly-developed European type, patents on which have been secured by Drying Systems, Inc. The Phoenix screen is composed of many small die-formed metal plates, linked together to form a wide belt-like structure, which is slowly revolved in its casing in a vertical position. The

Phoenix Constant-Effect Air Filter

upper drum is driven by a small electric motor. The lower drum with that portion of the screen passing under it, is submerged in the special viscous oil, contained in a tank, with drainage provided.

As the screen unit slowly moves over the drums, that portion between the drums is exposed to the incoming air. This air in passing through the screen, between the unit links, is cleansed of dirt which impinges on the viscous surfaces, and is caught. That portion of the belt submerged is automatically cleansed of its dirt load, and coated with fresh clean oil. In this way the filter offers uniform resistance to the flow of air, and the cleaning effect is not decreased with use.

The air may be received from both sides, passed to the space inside of the belt and taken out of the end of the unit, or it may be passed through from one side of the unit to the other, being twice filtered.



Phoenix Constant-Effect Air Filter, Detail of Filter Assembly

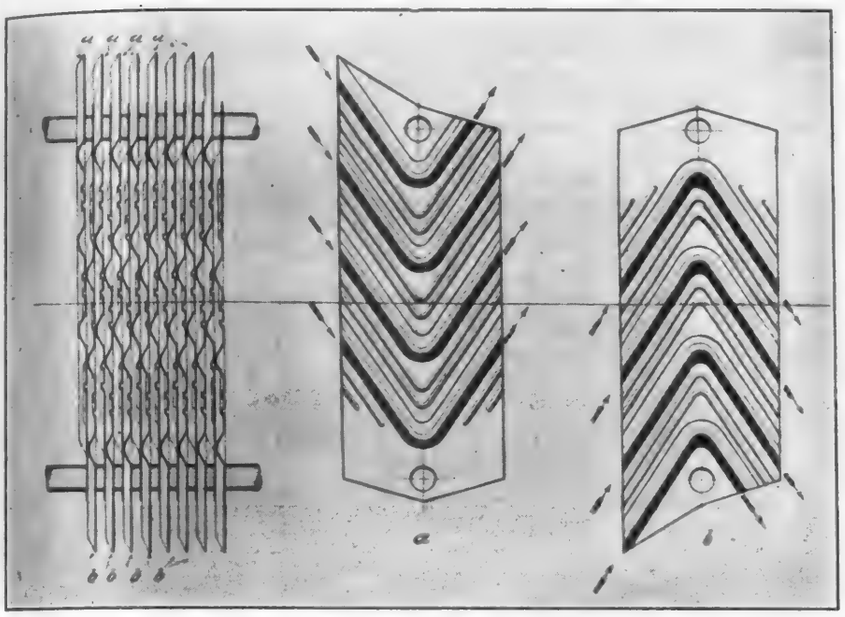


Diagram Showing Passage of Air Through Phoenix Constant-Effect Air Filter

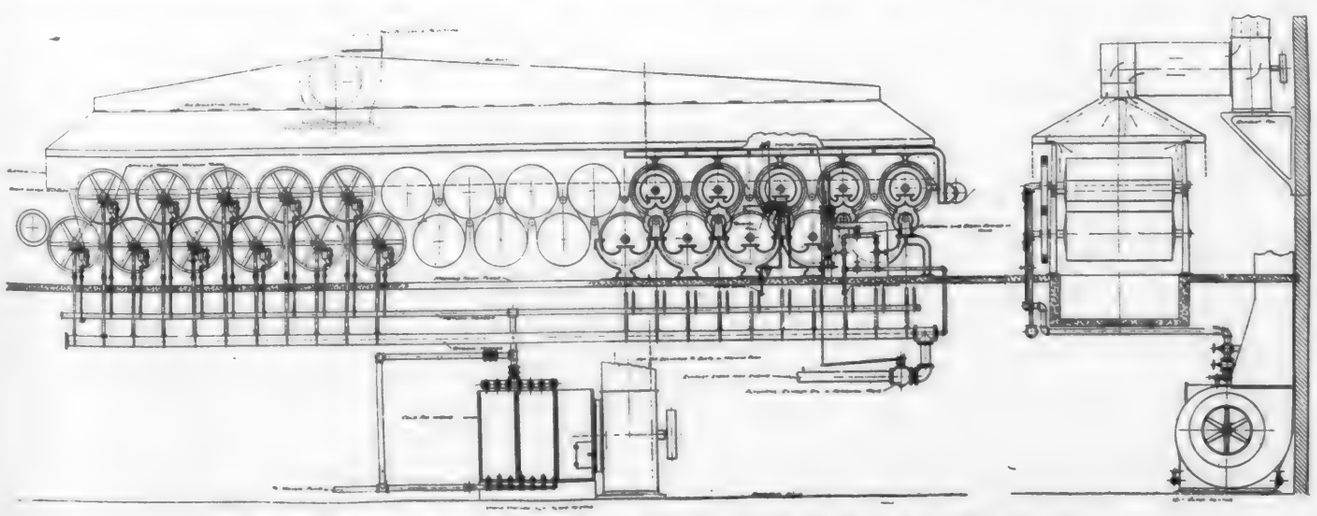
Phoenix units are made in several sizes, having capacities ranging from 2,200 c.f.m. to 34,000 c.f.m. The largest size contains 75 sq. ft. of filter area, and weighs nearly two tons. The catalog is well illustrated and contains all necessary tables, giving dimensions and capacities. Size 8½ x 11 in. Pp. 16.

REPUBLIC PYROMETERS are the subject of an elaborate publication, issued by the Republic Flow Meters Co., Chicago. A very complete discussion of pyrometer applications includes their use in the production of steel, in malleable-iron plants, in the ceramic industry, in glass working, diesel engine testing, gas plant operation, enameling processes, oil refining, cement mills, chemical plants, and in many other industries. A comprehensive article on the principles of operation is followed by illustrations of the various indicating and recording types, with samples of the records obtainable. Chapters on pyrometer selection, maintenance, checking, and handling, together with many temperature charts and a color-temperature scale make the book one of decided interest. Size 8½ x 11 in. Pp. 56.

STICKLE SYSTEM OF HEATING AND VENTILATING THE MACHINE-ROOM IN PAPER MILLS UTILIZING THE WASTE HEAT FOR DRYING THE PAPER is described in a circular received from the Stickle Steam Specialties Co., Indianapolis, Ind. This system has been given the name of the Stickle suction-hood ventilating system. The discharge line from the traps is connected to a Stickle vapor vacuum blast-coil heater which is used to heat the air to condition and ventilate the machine-room. The heater is connected with a vacuum pump maintaining a vacuum of from 10 in. to 15 in. bringing the temperature of the air down from 240° F. to 180° F. In this way sufficient heated air is furnished to heat and ventilate the machine room. Individual traps, it is pointed out, are not necessary to make the blast coil and ventilating system operate satisfactorily, as the company's rapid circulating system for draining the dryers can be used instead of individual traps, discharging into the heater. The main feature in this ventilating system is the design and construction of the hood over the machine which, with its multiblade suction fan equipment is capable of removing vapor from the hood at a velocity of 2,000 ft. per minute exhausting to the atmosphere.

GUARANTEED HEATING SATISFACTION AT MINIMUM COST, with a sub-heading "The Truth About Boiler Ratings" is the title of a manual issued by the H. B. Smith Co., Westfield, Mass., for the information of the architect, heating contractor and owner. The manual reviews the prevalent views regarding boiler ratings and offers the suggestion that the Bureau of Standards in Washington will some day take up this matter and determine a standard method for figuring ratings. The manual then goes on to tell how Smith boilers are rated and includes the three different ratings for each boiler which the company issued sometime ago, labelling them "Danger Red," "Practical Black" and "True Blue." The "Danger Red" ratings, it will be recalled, are those based on the A. S. H. & V. E. method of testing. The "Practical Black" ratings are the commercial standard catalog ratings which the company states "we have published, do publish and Blue" ratings "permit the boiler to operate with a maximum of fuel economy and heating satisfaction." Size 5 x 7 in. Pp. 32.

FLUES AND FLUE LININGS WITH RELATED DATA ON CHIMNEYS AND FIRE-PLACES, is the title of an extremely comprehensive and well-compiled publication, issued by the Eastern Clay Products Association, Philadelphia. The development of the modern chimney of scientific design and construction, from the prototype of Pompeii and ancient Greece, is shown, and the collection of



The Stickle Suction Hood Ventilating System, Diagram Showing General Arrangement

data on flue linings, sizes and construction, warrants the careful study of all heating engineers. Dimensions of standard flue linings, rectangular and round, are presented, together with many tables, formulae and illustrations. The standard specifications of the association are given, also a very complete bibliography on the subject. Size 8½ x 11 in. Pp. 32.

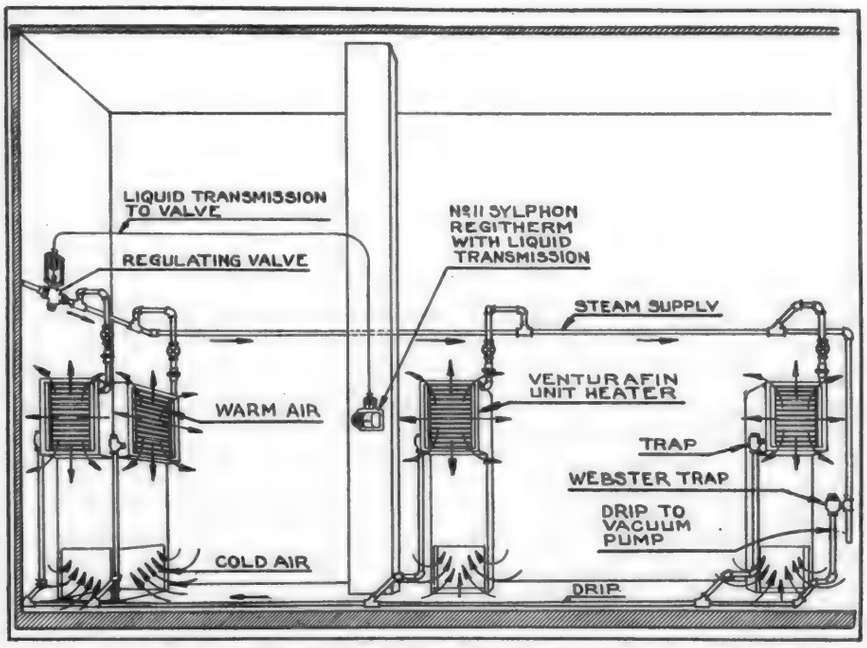
Uncle Sam Installs Kewanee Boilers is the title of a booklet just off the press of the Kewanee Boiler Company, Kewanee, Ill. The statement that Kewanee steel heating boilers are installed in a majority of Government-owned post-office buildings, is followed by several pages of illustrations of such buildings, and a long list of installations in various States.

Sylphon Regitherm, an instrument for automatically controlling air temperatures, is described in Bulletin R 102, issued by the Fulton Company, Knoxville, Tenn. This instrument finds its greatest usefulness in industrial establishments, where uniform temperature requirements are rigid and necessary. The essential construction is a metal bellows, containing an extremely volatile liquid, the vaporization of which creates tremendous pressures within the system. In the newest type, power to actuate the regulating valve is transmitted by the pressure of a liquid contained in duplex power transmission units, connected by flexible pipe. This permits instantaneous action, with practically no friction or other loss. Sylphon Regitherms are regularly supplied to operate within the range 60°-80° F., but on special order may be had in any range between the limits of 50°-250° F. An interesting installation of 39 Sylphon Regitherms in each of two Argentine battleships functioning for twelve years without a single breakdown, is described in the bulletin. These instruments are used to maintain uniform temperatures in the powder magazines. The bulletin also shows several examples of industrial installations. Size 8½ x 11 in. Pp. 12.

Burnham Water-Tube Type Boiler, for high-pressure water heating, is the title of a loose-leaf folder issued by Burnham Boiler Corporation, Irvington, N. Y. This line of boilers has double shaker grates, of the ridge type, shaking in two sections for ease of operation. The automatic damper regulator operates the drafts at the rear of the boiler in accordance with the changes in water temperature. The water-tube

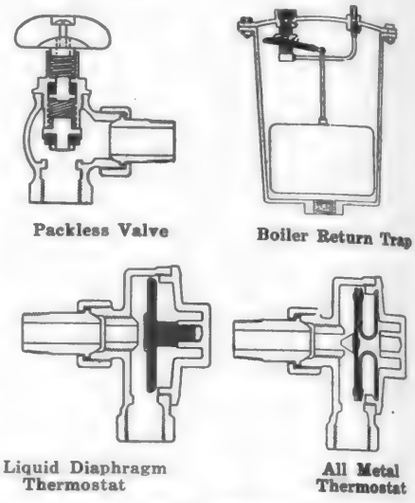
Section of Burnham Water-Tube Type Boiler Showing Flue Arrangement

sections are so designed that the products of combustion travel to the rear of the boiler, forward through a series of lower flues, and back to the smoke pipe through an upper tier. The folder lists boilers ranging from 1000 sq. ft. rating to 2800 sq. ft., water rating.



Venturafin Heating Units Controlled with No. 11 Sylphon Regitherm

Ideal "Stay-Rite" Heating Specialties are presented in a circular issued



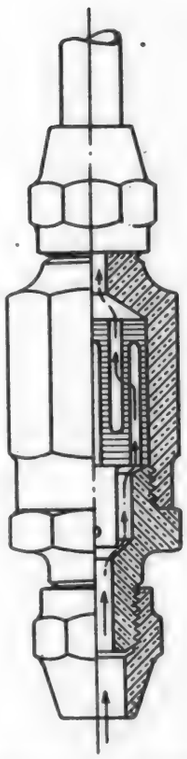
Sections of Ideal "Stay-Rite" Heating Specialties

by Ideal Heating Equipment Co., Cleveland, O. The products described include the Ideal packless valves, vents, boiler return traps and radiator traps.

Greenhouse Boilers, manufactured by the Brunswick-Kroeschell Co., New Brunswick, N. J., are described in a recent catalog. The preface announces that, during a single year, this company installed boilers to supply over three million square feet of glass. The various types and sizes of boilers are listed, with all necessary data. Size 8½ x 11 in. Pp. 20.

Kahlenberg Filter for Oil Fuel.—From the field of internal combustion comes an interesting and new type of filter for oil fuel. This is the design used on the oil engines of Kahlenberg Brothers Co., Two Rivers, Wis., which has placed it in the fuel lines of their engines for the past ten years. The filter consists of a brass casing, to each end of which are standard brass union fittings for copper pipe. The filter element consists of a brass plug, fitting into the cylinder with a snug fit, and having threads cut on its entire surface. From either end, six axially milled channels extend almost to the other end of the plug, alternating around the circumference. As will be seen, the oil entering at the inlet end of the filter, passes into the six channels opening into the inlet end, through the many threads, and into the six channels opening to the outlet end.

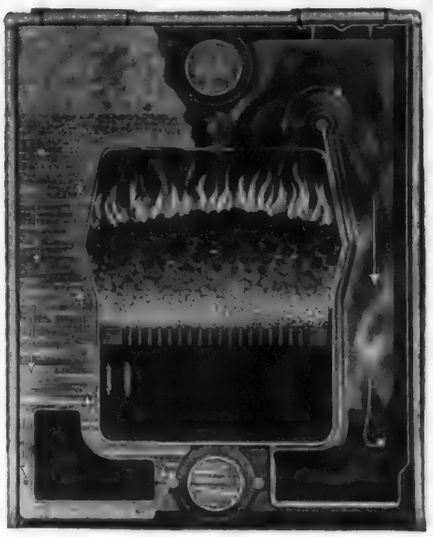
By cutting the threads to any desired size, the filter may be made to function to any degree. As the small nozzles of these oil engines are drilled from 0.006 in. it is evident that this type of filter may be readily adapted to oil burners. If the filter becomes clogged, it may usually be cleaned by striking the pipe, and cleaning by removal is a simple matter.



Kahlenberg Oil Filter

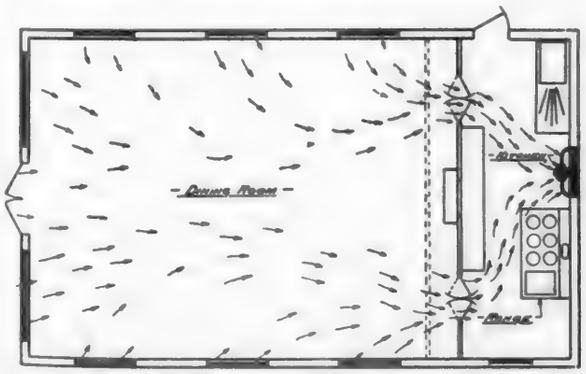
HOW TO GET RESTAURANT VENTILATING BUSINESS is the title of Bulletin No. 1 of the American Blower Company, Detroit. The foreword suggests that, as ventilation is an absolute necessity in first-class restaurants, business of this kind should not be difficult to obtain. It is urged first, that salesmen qualify themselves to intelligently and accurately handle the necessary calculations involved in such problems, and the cultivation of restaurant owners will lead to opportunities for use of such knowledge. The bulletin emphasizes the desirability of selling equipment of ample capacity, and then proceeds to outline the general methods of handling restaurant ventilating problems. Ventilation of a restaurant, it is stated, should be through the kitchen, as this eliminates any chance for kitchen fumes and odors to permeate the dining room. With exhaust fans or outlets located in the dining room, kitchen odors are drawn into this room. The bulletin proceeds to outline methods of determining air changes necessary and the proper size of fans for the work, giving a table of pipe sizes for various volumes with corresponding friction losses.

IDEAL TYPE A HEAT MACHINE titles one of the most exquisite pieces of advertising literature that has come from any manufacurer in any field. Needless to say, it is from the American Radiator Company, Buffalo, and, with a wealth of color illustrations, shows the new heat machine, exterior, interior, details of gas travel, of construction, and installation suggestions that indicate this machine a fit complement for the finest home. The new Corto radiator is also featured, its construction shown, and the saving in space that may be effected through its use. It would seem that such high class advertising would make a strong appeal to the class of customer sought for this machine, as the high character of the product is so alluringly displayed, and its high economic value so convincingly set forth.

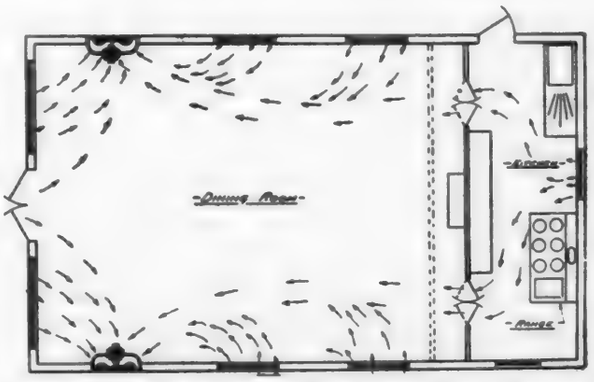


Sectional View of Ideal Type A Heat Machine, Showing Co-Ordination in Flow of Gases and Water

UNIVERSAL SMOKELESS BOILERS are presented in a new catalog issued by the Universal Smokeless Boiler Co., Ravenna, Ohio. Herein are described the double-grate, sectional, cast-iron water-tube boilers for steam or hot water, and the cast-iron sectional boiler for use with gas or oil burners. The smokeless boiler is designed with double grate, the Universal Company claiming that the results of long experience and many tests show it to be superior in efficiency to the single grate type. Again, it is stated that, with this design, smokeless combustion becomes less dependent upon expert firing, as the only precaution necessary is to keep the upper grate well covered. Coal is fired to the upper grate, which is cast integral with the sections. This, being a water-grate, adds materially to the efficiency of the boiler. The green fuel is distilled on this grate, the gases being drawn down into the combustion chamber between the upper and lower grates, where they are ignited by the heat from the incandescent mass on the lower grate, and pass directly to the vertical water-tubes in the rear of the boiler. Two baffle-plates lengthen the fire-travel. It is pointed out that the water tubes, being vertical, are not liable to accumulate soot deposits, and, with the large clean-out plates provided, any small accumulation may be readily removed. These boilers are made in two grate sizes, with many combinations ranging from 1500 sq. ft. steam capacity to 12,000 sq. ft. rating. There is also listed a single-grate up-draft boiler, rating from 1000 sq. ft. to 3400 sq. ft. The gas and oil boiler is built up of cast-iron sections, so designed that the products of combustion travel through wavy vertical channels, permitting a maximum heat extraction. Removable side-plates facilitate cleaning of the passages. These boilers are built in capacities ranging from 480 sq. ft. to 5340 sq. ft. The catalog contains instructions for assembling and setting the boilers, all necessary data, and prices. Size 5 x 7½ in. Pp. 40.



Proper Ventilation of Restaurant Dining Room and Kitchen



Improper Ventilation of Restaurant Dining Room and Kitchen

Death of A. C. Mott, Sr.

The death of A. C. Mott, Sr., chairman of the board of directors of the Abram Cox Stove Company of Philadelphia, occurred in Philadelphia, May 6, 1925. The death of Mr. Mott marks the passing of one of the most widely known and highly respected members of the heating industry. Having entered this line at the age of 16, he devoted the remaining 59 years of his life to building up the firm now known as the Abram Cox Stove Company.

Mr. Mott was born in 1850 at Glens Falls, N. Y. In 1866 he came to Philadelphia and obtained a position as moulder's apprentice in the foundry of the Cox, Whiteman & Cox Company. His two uncles, Abram and Joseph Cox, were partners in this firm, which had been established in 1847. Mr. Mott worked at successive jobs for this company for seven years during which time he rose step by step until in 1873, he was given the position of general superintendent. By this time, he had fully mastered all matters connected with the manufacturing end of the business.

He remained as superintendent until 1881, in which year both Whiteman and Joseph Cox died. Mr. Mott bought out their interests in the business at this time. In 1882 in accordance with the laws of the State of Pennsylvania, the firm became a corporation and has since been known as the Abram Cox Stove Company.

Abram Cox was president of this company from 1882 until he died in 1885, but was unable to take an active part in the business because of ill health. During these three years, Mr. Mott, in the capacity of assistant to the president, guided the destinies of the company, and under his management its business was greatly increased. This was before the day of sales organizations such as are known to-day, and in addition to his other duties, Mr. Mott was required to travel as a salesman. In this role, like every other which he tackled in his life, he made a great success.

At the death of Abram Cox in 1885, A. C. Mott became president of the Abram Cox Stove Company. His administration marked the beginning of an era of great progress for the company. Mr. Mott served as president until 1924, taking an active part in the business until 1922, when his son, A. C. Mott, Jr., assumed control of the company as vice-president. In 1924, Mr. Mott was elected chairman of the board of directors, and his son became president.

Mr. Mott survived four different changes in the officers of the company, and remained at the head of the business from 1882 until the time of his death, 43 years. In 1901 the Thomas, Roberts, Stevenson Company was purchased, and run under its original name until 1917, when it was merged into the Abram Cox Stove Company.

Mr. Mott knew the heating and cooking appliance business from top to bottom for he served in almost every position conceivable as a member of the organization of the Abram Cox Stove Company. Besides this, Mr. Mott was the inventor of the Novelty Circulator, one of the first cast-iron heating boilers put on the market.

A. C. Mott was a typical American business man. A keen observer of human nature at all times, he succeeded in surrounding himself with men of high character who kept his business running successfully. Moreover, his success was in no small measure due to the fact he knew just how everything should be done; so well, in fact that he could tell a skilled man how to go about doing things. Nor would he ask an employee to do anything he would not do himself.

Mr. Mott's hobby was agriculture and horticulture. He spent much of his time directing the operation of a large farm near Philadelphia, which he owned. Mr. Mott was a member of the Union League, Philadelphia Country, Manufacturers, and Edgemere Country Clubs.

He is survived by his widow; two sons, A. C. Mott, Jr., president of the Abram Cox Stove Company, and Merle Mott, secretary of the company; one daughter, Mrs. Green, all of Philadelphia; one sister, Mrs. Alice M. Hazlett of California; and one brother, Edwin P. Mott, treasurer of the Carr Supply Company of Chicago.

Deaths

GEORGE SMART, managing news editor of *Iron Age*, formerly chairman of the New York Editorial Conference, died at Forest Hills, N. Y., May 16. Mr. Smart was born in Chillicothe, O., in 1863. Following his primary education in the local schools, he was graduated from Ohio State University in 1886. His service on the college *Lantern* turned his mind toward journalism, and for over ten years he was attached to reportorial or editorial staffs of several Ohio papers, including the *Cincinnati Enquirer* and the *Cleveland Plain Dealer*, for which he acted as Washington correspondent. In 1902 Mr. Smart became identified with the *Iron Trade Review*, as associate editor, and three years later became editor, which position he held for twelve years. Since 1917 Mr. Smart has been associated with *Iron Age* and for over eight years has been one of the directing editors, giving special attention to the news and market pages. In addition to his vocational work, Mr. Smart has given largely of his time and effort to community and national matters. He has served as president of his college alumni association, and was an important figure in the Cleveland Chamber of Commerce. He was prominent in Forest Hills community life during his residence there, and for the past two years was a member of the executive committee of the National Conference of Business Paper Editors.

A. O. BACKERT, president of the Penton Publishing Co., Cleveland, O., and a well-known figure in the technical publicity field, died suddenly of heart disease, April 24. Mr. Backert served on the executive committee of the Associated Business Papers, Inc., from 1919 to 1924 and was honored with the presidency of the A. B. P. for the term 1922-1923. He was the author of the standard book on foundry practice and prominent in the associations connected with the foundry industry.

JOHN NEWELL HURTY, M.D., for many years secretary of the Indiana State Board of Health and one of the leaders in the formulation of the Indiana ventilation code, died in Indianapolis, March 27. He was born at Lebanon, Ind., in 1852, and received his education in the schools and colleges of the State, receiving degrees from Purdue University in 1879 and from the Medical College of Indiana University in 1881.

Mr. Hurty was appointed secretary of the Indiana State Board of Health in 1896, serving in that capacity and as State Health Commissioner until the fall of 1922. During this period he wrote and secured the passage of practically all the health laws of the State. Members of the American Society of Heating and Ventilating Engineers will recall his appearance before the society at its Indianapolis meeting in 1909 when he delivered an address on the Indiana ventilation situation.

WILLIAM H. WILEY, well known in the technical and engineering field, died suddenly May 1. He was born in New York City in 1842, was graduated from the College of the City of New York in 1861, with the degree of A.B., and in 1866 received the degree of C.E. from Rensselaer Polytechnic Institute. Major Wiley served with distinction in the Civil War, and was for several terms a member of Congress from New Jersey. At the Brussels Exposition of 1897, he served as president of the International Jury.

Since 1876 Major Wiley has been a publisher of scientific books as a member of the firm of John Wiley & Sons. For more than forty years he was treasurer of the A. S. M. E., in addition to which he has been a member of the A. S. C. E., A. I. E. E., A. I. M. & M. E.,

New York Office of Heggie-Simplex Boiler Company

A well-equipped New York branch office has been established by the Heggie-Simplex Boiler Company, Joliet, Ill., at 101 Park Avenue, New York, with S. W. Hessenmueller in charge. Associated with Mr. Hessenmueller are T. M. Cochran, well known to the New York heating trade through his connection with the Cornell Company and E. F. Keating Company, and W. M. Crew.

Minnesota State Capitol, St. Paul, Minn.—Cass Gilbert, Architect 3107

In Constant Service Since 1903

A POWERS System of Temperature Control

Alec Nicoll, Chief Engineer of the Minnesota State Capitol Building, says of the POWERS System of Temperature Control:

"* * * has been in constant use since 1903 * * * still working satisfactorily * * * have had very little trouble * * * still good for another long period."

This is only *one* instance of the long and satisfactory service which the POWERS System renders. Our booklet, "The Elimination of Heat Waste," gives many more. If you haven't a copy in your library, send for one. You'll find it valuable.

The POWERS Thermostat is the secret of the accuracy, dependability and long life, free from repair trouble, of the POWERS System.

THE POWERS REGULATOR COMPANY

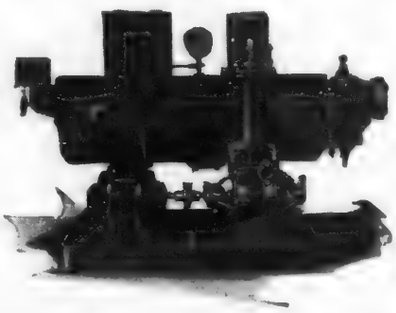
34 years of specialization in temperature control

2718 Greenview Ave., Chicago

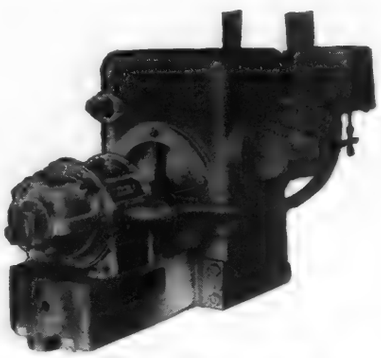
Atlanta, Baltimore, Boston, Buffalo, Butte, Mont., Charlotte, N. C., Cincinnati, Cleveland, Denver, Des Moines, Detroit, El Paso, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, Nashville, New Orleans, New York, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Seattle

CANADIAN OFFICES: Toronto, Montreal, Halifax, Winnipeg, Calgary, Vancouver

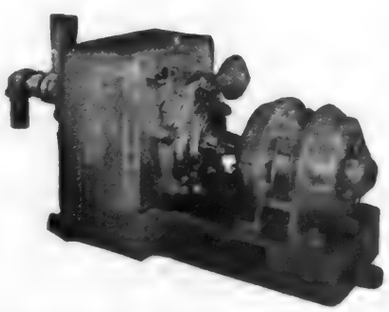
A Pump That Assures Good Heating



Motor-driven Jennings Hytor Vacuum Pump, for return line heating systems, in capacities up to 300,000 sq. ft. equivalent direct radiation.



Motor-driven Jennings Hytor Condensation Pump, Unit Type, for removing condensate from steam heating systems, in capacities up to 16,000 sq. ft. equivalent direct radiation.



Motor-driven Jennings Hytor Vacuum Pump, Size M, for return line heating systems, in capacities up to 5000 sq. ft. equivalent direct radiation.

Jennings Hytors are well known for the unsurpassed year-in and year-out service they always give. They are recognized by architects, heating engineers, contractors, and owners everywhere as a vital factor in all heating systems where the best results must be secured.

Hytors save practically half the power consumed by other pumps of equivalent capacity, and occupy only about one-third the space of reciprocating equipment. They are quiet in operation and the discharge is entirely free from pulsation.

Design and workmanship are of the highest grade throughout and in conformance with the most modern developments—bronze fittings, tobin bronze shaft mounted on annular ball bearings outside of pump casing, air rotor and water impeller, oiling rings, etc., of bronze, all parts made on a limit gauge basis and interchangeable.

Write today for copies of the Jennings Hytor literature—also for a graphic device showing the unique principle of Jennings Hytor operation.

NASH ENGINEERING COMPANY

So. Norwalk **Connecticut**

Branch Sales Offices: Atlanta, Boston, Buffalo, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Washington. **In Canada:** Montreal, Toronto and Vancouver. **European Offices:** London, Eng., Norman Engineering Co.; Brussels, Belgium, and Amsterdam, Holland, Louis Reijners & Co.; Oslo, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Hytor

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

2007-38

Trade and Miscellaneous Notes

Coming Events

June 15-17, 1925—Semi-annual meeting of the American Society of Heating and Ventilating Engineers in Atlantic City, N. J. Headquarters at Hotel Traymore.

June 17-20, 1925—Nineteenth annual convention of the Smoke Prevention Association, in Grand Rapids, Mich. Headquarters at the Pantlind Hotel.

Building Operations for April

Building operations for April, 1925, as reported by the F. W. Dodge Corporation, made the largest monthly total on record. Contracts awarded in the 36 eastern States (which included about seven eighths of the total construction volume for the country) amounted to practically $547,000,000.00, this being an increase of 14% over March, and of 13% over April of last year.

Last month's record included the following important items: $256,414,300, or 47% of all construction, for residential buildings; $95,432,400, or 17% for public works and utilities; $63,968,900, or 12% for commercial buildings; $46,567,900, or 9% for industrial buildings; and $33,154,600, or 6% for educational buildings.

In addition to the big gains in actual work started there is also a big gain in prospective work. Contemplated new projects reported in April amounted to $760,657,600, an increase of 25% over the amount reported in April of last year.

SLUMP IN EASTERN SECTION

April building contracts in New York State and northern New Jersey amounted to $132,032,000. This was an increase of 57% over March, but it was 22% under the total for April of last year. Last month's contracts brought the total of work started during the first four months of 1925 up to $390,442,800, a decrease of 20% from the corresponding period of 1924.

Last month's record included: $68,704,000, or 52% of all construction, for residential buildings; $25,094,600, or 19% for commercial buildings; $10,895,000, or 8% for social and recreational projects; $9,098,900, or 7% for industrial buildings; and $8,598,800, or 7% for public works and utilities.

Contemplated new work reported in April amounted to $167,788,800, an increase of 2% over the amount reported in April of last year.

MIDDLE WEST BREAKS RECORD

Construction started in April in the Central West (Illinois, Indiana, Iowa, Wisconsin, Michigan, Missouri, Kansas, Oklahoma and Nebraska) amounted to $157,668,200, being the highest monthly total on record for the district. The April contracts brought the total of new construction started since January 1 up to $425,565,200, an increase of 26% over the first four months of last year.

Last month's record included: $82,242,500, or 52% of all construction, for residential buildings; $30,115,600, or 19% for public works and utilities; $12,933,000, or 8% for commercial buildings; $12,467,800, or 8% for educational buildings; and $7,356,000, or 5% for industrial buildings.

Contemplated new work reported in April amounted to $190,864,500, an increase of 24% over the amount reported in April of last year.

ANOTHER AUTOVENT SALES HELP

Right at the time the ventilation question is uppermost in the minds of your prospects we offer as a sales help, an attractive 24" x 18" lithograph, showing the Autovent line in natural colors.

This display card designates you as an Autovent representative and is mounted on durable mat board, equipped with hanging cord for display in your show window or on the wall of your store.

A copy is yours for the asking.

ACTIVE SALES OFFICES AND BRANCHES IN ALL PRINCIPAL CITIES

AUTOVENT FAN & BLOWER CO.
730-738 W. MONROE STREET, CHICAGO

Manufacturers' Notes

Racine Radiator Co., Racine, Wis., has inaugurated a co-operative group insurance program providing protection for approximately 180 employees, with a total coverage of $200,000. The company is also providing a free visiting nurse service, and will make a regular distribution of pamphlets on health subjects and sanitation.

Kieley & Mueller, Inc., New York, announce the appointment of C. H. Dutcher as manager. Mr. Dutcher has been associated with Kieley & Mueller for the past five years.

Warren Webster & Co., Camden, N. J., have removed their Cincinnati office to the Provident Bank Building, with W. C. Green as district manager. Warren Webster & Company have found it necessary to enlarge their Columbus, Ohio, office, of which S. B. Shearer is in charge.

Trane Co., LaCrosse, Wis., has appointed H. K. Brasch manager of the Seattle, Wash., office. Mr. Brasch is a graduate of the University of Iowa, and has had an extensive experience in the heating field, having been connected with the Crane Company for seven years. The company is now represented in Atlanta, Ga., by Moody B. Smith.

General Boilers Co., Waukegan, Ill., has appointed W. G. Vollmer as its St. Louis representative, with offices in the Planters Building.

Sterling Engineering Co., Milwaukee, Wis., has appointed Himelblau, Agazin & Co., 30 North Dearborn St., Chicago, as its representative for Chicago, northern and eastern Illinois.

M. S. Little Mfg. Co., Hartford, Conn., has purchased the "Sure Hot" water heater business from the Whitlock Coil Pipe Co., of Hartford, and will continue the manufacture of this product. The policy of the new owners will be one of aggressive expansion of the business already built up. Whitlock Coil Pipe Company will continue the manufacture of storage and instantaneous heaters and other heat-transfer products.

Crane Co., Chicago, announces the election of Charles D. Little to be vice-president in charge of sales, and to be a member of the board of directors. H. W. Seymour, branch manager at Baltimore, was elected general manager of sales, to succeed Mr. Little. Walter Evenson was elected treasurer.

Fulton Co., Knoxville, Tenn., has opened an office in Boston, at 136 Federal Street, which will be in charge of L. C. Price, formerly in charge of the Connecticut territory. Mr. Price is a Cornell graduate, and has been identified with the heating and ventilating field for a number of years.

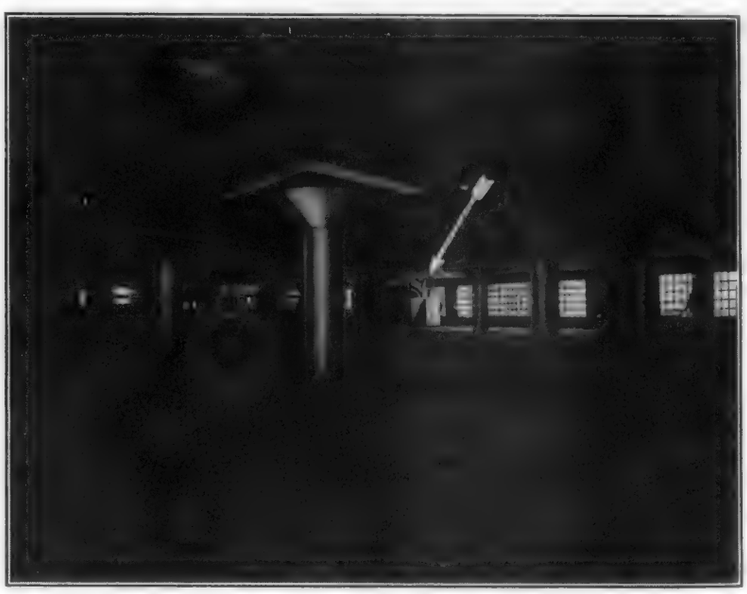
American Blower Co., Detroit, Mich., announces it will be the policy of the company to sell the Venturafin unit heaters through the heating contracting trade. For the past three years the company has been improving and developing the market for the Venturafin method of heating. Its preliminary work, it is stated, has now been carried to a point where it becomes possible to announce this policy under which the future development of the Venturafin market will be conducted.

Trane Co., LaCrosse, Wis., has completed a new annex covering 10,000 sq. ft., to be used for the assembly of heating specialties and as a shipping department.

Illinois Engineering Co., Chicago, has completed an addition to its factory, which will permit an increase in production of at least 50%, relieving the overloaded condition that has existed for over a year.

Utica Heater Co., Utica, N. Y., has moved its Philadelphia office from 1712 Ludlow Street to 629 Chestnut Street, where T. C. Cooper will be in charge.

PECCO HEATERS
Serving the Pevely Dairy Company, St. Louis, Mo.



After considering different types of fan blast heaters and direct radiation to heat their garage, which contains 300,000 cubic feet, built of concrete with many windows and driving ramps connecting the different floors, Mr. Ralph Copp, Chief Engineer of the above plant, selected the PECCO HEATER. After installing same and seeing the results obtained, he placed orders for others to be used in the store room, machine shop and automobile repair shop. We invite you to write Mr. Ralph Copp in reference to this equipment, whom we believe will give you a favorable report concerning the operation and efficiency and low horsepower of this equipment.

Other plants, who are being served as well as the above are Pauly-Jail Building Company, Scruggs, Vandervoort & Barney, Kregal Casket Company, Griffith Furniture Company and many others. Write for full details of this equipment and catalog.

2957 N. Market Street **Pecco Incorporated** St. Louis, Mo.

PECCO INC. PECCO ST. LOUIS

The efficiency of the Johns-Manville Underground System at completion is at least 90%—and it stays efficient.

Efficiency—after twenty years

THE efficiency of an underground insulation system is important at the time of completion—but it is still more important "twenty years after."

We build the Johns-Manville Underground System of Insulation on a "twenty years after" basis—as hundreds of users can testify.

JOHNS-MANVILLE INC. 292 MADISON AVENUE AT 41ST STREET, NEW YORK CITY
Branches in 63 Large Cities. For CANADA: CANADIAN JOHNS-MANVILLE CO., Ltd., Toronto

Trade Mark Reg. U.S. Pat. Off.
Asbestos
and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

Underground System of Insulation

Advance Boiler Corporation, New York, has removed from Grand Central Terminal to the Bush Terminal Building, Brooklyn, where it will be able to carry a stock.

Utica Heater Co., Utica, N. Y., has moved its Chicago office to 365 East Illinois Street. Vice-president James Doherty is in charge of the territory covered by this office.

Jenkins Bros., New York, has taken over the business of H. A. Rogers Co., New York, and will discontinue the lines carried by that company, with the exception of the Moncrieff Scotch gauge glasses.

Bayley Manufacturing Co., Milwaukee, Wis., announces that H. J. Clark, formerly with the B. F. Sturtevant Company, has been appointed district manager of its Cleveland office. Mr. Clark has a wide acquaintance in the trade in St. Louis, Kansas City, Chicago and Cleveland.

International Heater Co., Utica, N. Y., announces the appointement of Samuel H. Allston as assistant advertising manager, succeeding William J. Grover, resigned.

George D. Hoffman, president of the Hoffman Specialty Co., Waterbury, Conn., has recovered from an illness that has incapacitated him for several months.

Hart & Crouse Co., Utica, N. Y., has appointed William E. Krueger as representative in the New Jersey territory.

Studebaker Corporation, South Bend, Ind., has elected Paul G. Hoffman, son of George D. Hoffman, president of the Hoffman Specialty Company, to be vice-president in charge of sales.

Thatcher Co., New York, has moved into the arcade store in the Berkeley Building, 19-25 West 44th Street.

United States Radiator Corp., Detroit, has acquired a new concrete warehouse, covering 25,000 sq. ft., on 75th Street, Chicago.

American Radiator Co., New York, has opened a new warehouse in Chicago, at 31st Street and South Central Park Avenue, doubling its Chicago storage facilities.

Gurney Heater Mfg. Co., Boston, Mass., has awarded contracts for a considerable addition to its factory in Framingham, Mass.

Gorton & Lidgerwood Co., New York, has appointed the Perkins-LeNoir Co., Drexel Building, Philadelphia, to be sales agents for the Gorton vapor heating system and other products.

Republic Flow Meters Co., Chicago, has opened a factory branch office at 617 Engineers Building, Cleveland, O., in charge of L. C. Wilson, formerly of its Pittsburgh office.

Trane Co., LaCrosse, Wis., has established a branch office at 412 Temple St., New Haven, Conn., and has appointed F. R. Menzies as manager of this territory. Mr. Menzies is a graduate of Rensselaer Polytechnic Institute, and, since graduation has been associated with John Menzies, heating contractor, of New Haven, as designing and supervising engineer.

Stickle Steam Specialties Co., Indianapolis, will soon take possession of its new building on Valley Drive. The new plant is of the latest type of construction, with separate laboratory, and will enable the company to double its output of the past year, which was, in turn, double that of the previous year.

Aeolus Dickinson Co., Chicago, has, for the second time in two years, been obliged to enlarge its shops for the production of Aeolus ventilators.

York Heating & Ventilating Corp., Philadelphia, announces the appointment of W. D. Graham to the management of its Cleveland office. Mr. Graham has been long identified with the heating and ventilating field, through

WHY LET THAT UNHEATED BUILDING WORRY YOU

We manufacture Unit Heaters and Fan Heating Systems for every need. If steam is not available, our all steel direct fired Fan Furnace will meet your requirments.

Send us your heating problems and we will show you the easiest and cheapest way.

Recommendations and prices furnished cheerfully without cost to you.

COMET UNIT HEATER

Suitable for use where steam and hot water is available. This Heating Ace is especially adapted where compactness and lightness in weight is of importance. For complete description write for Bulletin No. 85.

DIRECT FIRED FAN FURNACE

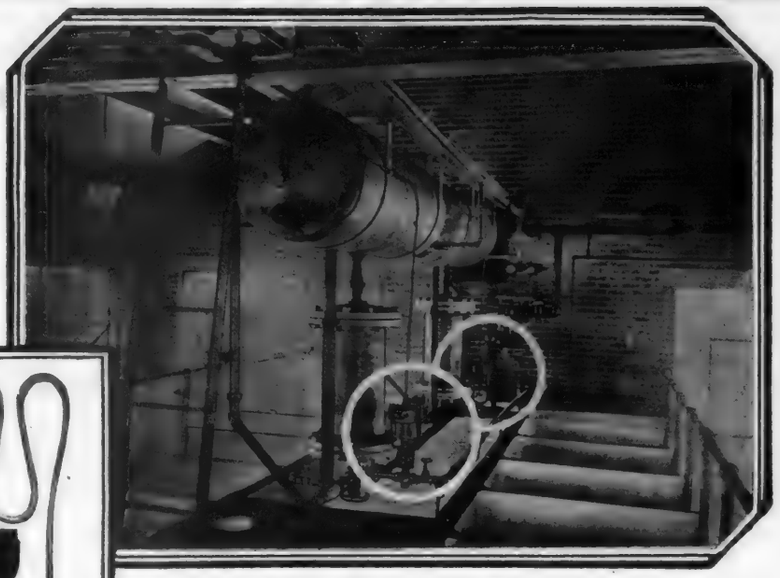
For use where steam or hot water is not available. For complete data write for Bulletin No. 90.

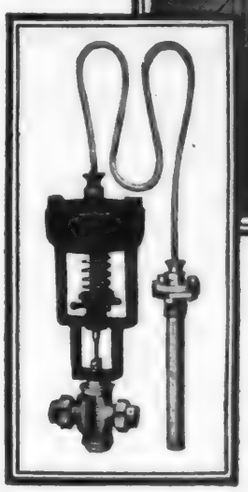
THE NEW YORK BLOWER COMPANY

CHICAGO, ILL. *Branch Offices in Principal Cities* LA PORTE, IND.

Sylphon

This is the registered trade-mark of The Fulton Company. If it isn't marked SYLPHON, The Fulton Company does not make it.





This illustration shows an actual installation of two No. 931 Sylphon Temperature Regulators (courtesy of Plumbers Trade Journal)

Sylphon Temperature Regulators Controlling Hot-water for Showers and Wash Basins in a large Industrial Wash-room.

IN this installation the two overhead horizontal hot-water storage tanks are heated by the two vertical indirect water heaters located under them with steam at 15 lbs. pressure.

The tank temperature is held uniform and steady by thermostatic control of the steam supply to the heaters through Sylphon Temperature Regulators. The thermostatic bulb of the Regulator is screwed into the end of each tank near the bottom—the valve of the Regulator in the steam line to each heater.

Advantages gained are

First, that the hot water supply for this large washroom is always furnished, night or day, at the same desired temperature.

Second, it positively prevents any possibility of the workmen becoming scalded by the water being too hot.

Third, it prevents loss of time by workmen having to stand and draw off water if it is too cold, waiting for the hot to come, which sometimes is not there.

Fourth, it prevents excessive temperature of hot water, which causes rapid corrosion of the storage tanks, piping, etc. This gives longer life to the system.

Fifth, considerable economy in the use of steam (which means fuel) is obtained, due to the automatic control shutting off the steam when it is not required.

The secret of the Sylphon accuracy is the Sylphon Bellows

This bellows, used as the expansion member in all Sylphon Temperature Regulators is drawn from a flat sheet of metal without a seam or joint. It will not bend, burst or leak. Diagrammatic cut shows its extreme flexibility. Refuse imitations.

Other applications of similar Sylphon control.

Similar applications can be made by heating men in apartments, clubs, hotels, hospitals, etc. Let us send you our new bulletin showing detailed layout drawings of these installations. *Ask for Bulletin WTR-105.*

THE FULTON COMPANY KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

Sales offices in: NEW YORK, CHICAGO, DETROIT, BOSTON, PHILADELPHIA, *and all the principal cities in U. S.*
European representatives: Crosby Valve & Engineering Co., Ltd., 41-42 Foley Street, London, W.I., England.
Canadian representatives: Darling Bros., Ltd., 120 Prince Street, Montreal, Canada.

association with the Buffalo Forge Company, the Goodyear Tire and Rubber Company, and, more recently, doing business as W. D. Graham & Company, Columbus, O.

Hardinge Fuel Oil Heating Co., Chicago, has appointed to its sales force, M. G. Harbula, formerly of the Atmospheric Conditioning Company, of Philadelphia, Pa.

Heggie Simplex Boiler Co., Joliet, Ill., will be represented in St. Louis by I. K. Gozzen and J. F. Meagher, with headquarters in the Laclede Building.

Gorton & Lidgerwood Co., New York, announces that Anchor Sanitary Co., 123 Third Ave., Pittsburgh, will handle the Gorton single-pipe vapor system in that territory.

National Radiator Co., Johnstown, Pa., is building a new warehouse in Cincinnati, O., at Spring Grove Avenue and Elmira Avenue and the B. & O. Railroad, Camp Washington. The building will be a modified warehouse and office structure and will provide a total floor space of 11,000 sq. ft. W. M. Schildman is the company's Cincinnati manager.

Mueller Company, Decatur, Ill., has broken ground for the erection of a new building to be devoted to the manufacture of vitreous ware. The company has quietly purchased a large tract of land outside the city limits, where a town will be developed for the benefit of the employees, and where, ultimately, all of the activities of the organization will be centered. The new building will be a one story saw-tooth brick structure, 201 ft. x 536 ft., and will be equipped with the latest machinery for the manufacture of vitreous products. Oil fuel will be used in the kilns, and the daily capacity, at the outset, will be 500 pieces.

Gorton & Lidgerwood Co., New York, has appointed the Anchor Sanitary Co., 123-127 Third Avenue, Pittsburgh, Pa., as its Pittsburgh representative.

Duriron Co., Dayton, O., has appointed R. L. Hanschke of Pittsburgh as its representative in West Virginia, eastern Ohio and western Pennsylvania. Mr. Hanschke will handle Duriron acid-proof pipe and fittings and Duriron exhaust fans.

Swartwout Co., Cleveland, O., announces price reductions of 25% on Swartwout rotary ball-bearing ventilators.

New Incorporations

Baker Oil Burner Sales Co., Seattle, Wash., capital $10,000. Incorporators: C. H. Williams, W. H. Mankey and M. L. Brandt.

Homer C. Perkins Co., Inc., Boston, capital $50,000, to conduct a heating business. Homer C. Perkins, Watertown, Mass., is president and treasurer.

Wells Tap & Die Co., Greenfield, Mass., capital $10,000. President, Frederick E. Wells; treasurer, William S. Howe; secretary, Fred W. Wells.

Automatic Home Heating Co., Denver, Colo., capital $100,000. Incorporators: H. W. Knight, G. S. Phillips and A. H. Copley.

White & Crowley, Inc., Springfield, Mass., capital $25,000, to conduct a heating and plumbing supply business. President, William H. White; treasurer, B. E. Crowley. The other incorporators are John F. Crowley and James F. White.

American Heating Co., Wilmington, Del., capital $150,000, to deal in heating equipment.

Thornley Supply Co., Pawtucket, R. I., capital $150,000, to engage in the heating and plumbing business. Incorporators: John Y. Thornley, Wallace Y. Thornley and Albert L. Thornley.

Zack & Co., 2129 Lake St., Chicago, Ill., capital $15,000, to manufacture heating and ventilating equipment. In-

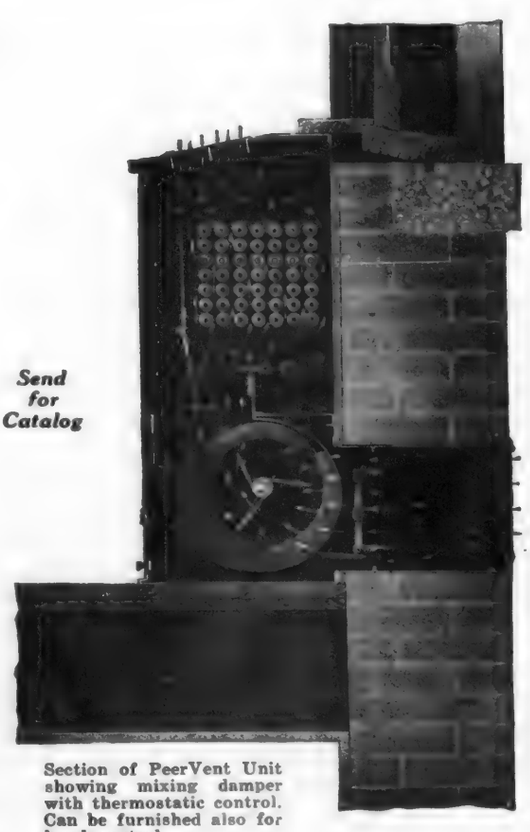
PEERVENT

Heating and Ventilating Unit

This new PeerVent Unit is only 36 inches high by 14 inches deep. Provides thorough ventilation for each room independently, without drafts. Easy to operate, dependable, noiseless and effects big cost and space savings. Equipped with the new Peerfin Radiator, which is made in our own factory, subject to rigid inspections and tests. Easy to install; adaptable to all steam systems; no remodeling required for old buildings.

Peerless Unit Ventilation Co., Inc.
Skillman Ave. and Hulst St., Long Island City, N. Y.

Send for Catalog



Section of PeerVent Unit showing mixing damper with thermostatic control. Can be furnished also for hand control.

PEERLESS
UNIT SYSTEM
Heating and Ventilating

Apparently a Little Thing

AN apparently little thing like a pipe hanger has been of real importance in establishing the superiority of Grinnell piping installations. Why? Because they make for permanently straight lines. Because they offered an easy means of taking care of the inevitable sags due to settling of buildings, weight of machinery, etc.

Now this Grinnell specialty can be bought in the open market. If your jobber doesn't carry the line ask us for the name of the nearest distributor. Hanger Catalog No. 3 is full of engineering data that will help you in solving any problem of hanging or supporting pipe. Send for your free copy today. Address Grinnell Company, Inc., 280 W. Exchange St., Providence, R. I.

GRINNELL

Fittings, Hangers, Valves, Pipe Bending, Welding, Piping Supplies, Etc.

corporators: H. J. Zack, Mrs. I. A. Zack and J. B. Cook.

Economy Plumbing, Lighting & Heating Supply Co., Boston, Mass., capital $60,000. Incorporators: William C. Hutch, Marlboro; Joseph Sigel, Brookline; and Maurice Tobey, Chelsea.

Ferguson Oil, Heating & Engineering Co., St. Louis, Mo., capital $50,000. Incorporators: Thomas B. Ferguson, Louis Wallrapp and Jacob W. Kisling.

New Firms and Business Changes

Abco Boiler Corporation, New York, announces the purchase of the Advance Boiler Corporation, and will be located in the Bush Terminal Building, Brooklyn, with factory at Poughkeepsie, N. Y. The Abco Boiler Corporation will continue the manufacture of Abco boilers, enlarging the line where necessary.

Corbit Plumbing and Heating Co., Reading, Pa., has appointed H. A. Erickson as manager and engineer of the company's heating department. Mr. Erickson was recently with Fitzpatrick & Hoepfner Company, Columbus, O.

C. P. Yaglogiou, for some time associated with the A. S. H. & V. E. Research Laboratory in Pittsburgh, is now instructor in ventilation and illumination in the School of Public Health, Harvard University. Mr. Yaglogiou is a graduate of Cornell University, having previously graduated from Roberts College, Constantinople. After his research work at Cornell, leading to the degree of master of mechanical engineering, he joined the laboratory staff, where he soon gained recognition through the publication of several papers. In addition to his teaching work at Harvard, Mr. Yaglogiou will devote considerable time to further research work in air conditioning.

Lewis & Capron, Chicago, have dissolved their partnership by mutual agreement. Mr. Lewis will continue engineering practice under his own name at 407 South Dearborn Street, Chicago, while Mr. Capron will be associated with Kehm Brothers, 51 East Grand Avenue, Chicago, in the contracting business.

Harold F. Hart has engaged in business at 105 State Street, St. Joseph, Mich., as heating engineer.

S. E. Fenstermaker & Co., Indianapolis, Ind., is the new name under which S. E. Fenstermaker, formerly of Weinshank & Fenstermaker, will cary on business as sales engineers. Mr. Weinshank, having disposed of his interest in the former association, is on a business trip to Europe.

Albert B. Franklin Co., 25 Haverhill Street, Boston, has been obliged, through rapidly expanding business, to lease the entire five floors of the building at that address.

V. N. Welamb Co., has removed to larger quarters at 2313 Walnut Street, Philadelphia.

Hanley & Co., heating and ventilating engineers, announce the opening of new offices at 6 North Clark Street, Chicago.

Everett, Wash.—Northwest Heating and Power Company will build a $50,000 heating plant, containing two 400 H.P. boilers, and will, as rapidly as possible, extend its pipe lines to all parts of the territory covered by its franchise.

Washington University, St. Louis Mo., has completed a $300,000 power and heating plant that, in many respects, is unique. Replacing the old power plant that has served the university since the Worlds' Fair in 1904, the new building has been designed in complete harmony with the architectural scheme of the university, even to the extent of building the 190-ft. stack into a Gothic tower, buttressed, and ornamented with gargoyles. Jamieson & Spearl are the architects. The heating plant will serve the entire university group, and the old building will be remodeled and devoted to laboratory work.

RADIATOR VALVE

RADIATOR TRAP

They "Stay-Rite" Because They Are Made Right

The "Stay-Rite" Heating Specialties are manufactured by men of long experience in the heating industry and who are thoroughly familiar with the requirements of such specialties. "Stay-Rite" products have long since passed the experimental stage and have proved their efficiency in actual practice through many heating seasons. Let us send full details.

The Ideal Heating Equipment Co.
1250 West 4th Street CLEVELAND, OHIO

BOILER TRAP

QUICK VENT

FLOAT VENT

The Original Boiler Designed Especially for Oil Burners

BREESE Burn Oil Boiler

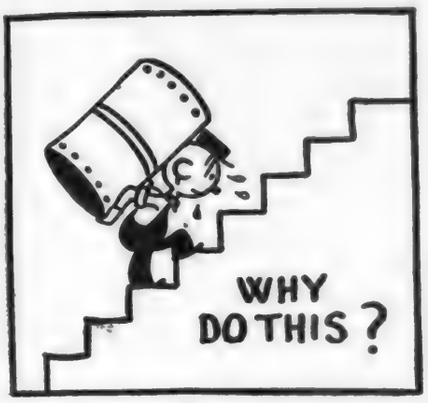
Four years of wide distribution has proven the efficiency of its improved construction.

The heat goes to the job, not up the stack.

Write for Bulletin A-1
Dealers Territory Open

BREESE ENGINEERING CORPORATION
341 EAST OHIO STREET
CHICAGO, ILL.

Good-bye Expansion Tank



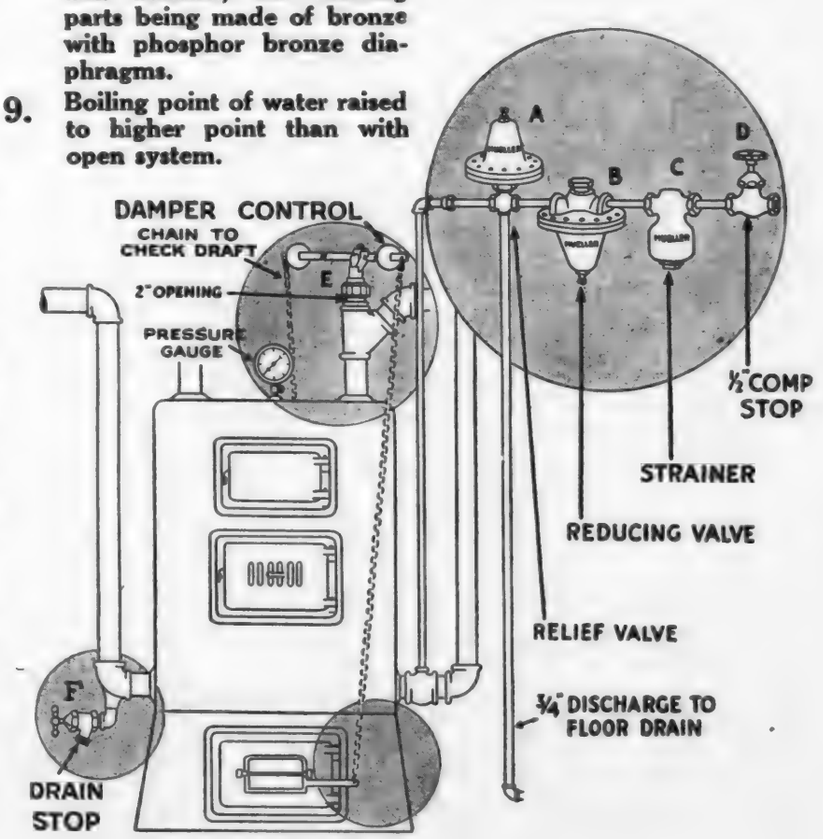
Mueller's System of Hot Water Heat Control has revolutionized hot water heating installations. It completely eliminates and supersedes both the overhead open tank and the closed basement tank. To accomplish this the Mueller Co. perfected special reducing and relief valves and combined them with a perfected damper regulator. So now —absolutely **without** any tank—the water supply is furnished automatically, relief is automatic and damper regulation is automatic.

Read the great advantages listed below. Write for further information and remember this—**the installation does not cost one penny more than the antiquated open or closed tank makeshift.** Every installation of a Mueller System **cuts your labor cost** and **increases your merchandise sales!**

MUELLER

Automatic Hot Water Heat Control

1. **No expansion tank, either open or closed.**
2. **Quickly installed on either new or old jobs.**
3. **Water in system always fresh.**
4. **Rapid circulation, due to pressure and fresh water.**
5. **Entirely automatic as to supply, relief and damper regulation.**
6. **A very considerable saving in fuel, due to automatic control of dampers and rapid circulation.**
7. **Perfectly safe, as both reducing valve and relief valve are operated by the pressure of the water in the system.**
8. **The reducing and relief valves are positive in action and durable, the working parts being made of bronze with phosphor bronze diaphragms.**
9. **Boiling point of water raised to higher point than with open system.**



Distributed by Leading Jobbers Everywhere

MUELLER CO.

(Established 1857)

Factories: Decatur, Ill., Port Huron, Mich.

Branches: New York, San Francisco, Los Angeles

Canadian Factory: MUELLER, Ltd., Sarnia

Ontario Sanitary and Heating Engineers

A weak spot in heating practice as generally followed in Canada was pointed out at the recent annual convention of the Ontario Society of Domestic Sanitary and Heating Engineers when Chairman P. C. Mansell of the Society's Heating Committee urged the craft to study the theoretical phases of their work and become more competent along "is that too many operators are not con- engineering lines. "The great difficulty encountered in our business," he stated, versant with the theoretical side of their trade. Too much confidence is placed with the wholesalers."

"Why cannot every operator," asked Mr. Mansell, "accumulate sufficient knowledge to compute radiator quantities, lay out heating plans, estimate costs and engineer his own business? In doing so he will speedily become more independent of any particular wholesaler, and will be able to traffic wheresoever he may please. So long as the wholesaler receives requests for plans and estimates then so long is he going to maintain this evil practice which is tending to degenerate a steam fitter into a pipe fitter."

As Mr. Mansell pointed out, the engineering staff of a wholesaler is no small part of his overhead and this overhead being applied to his selling costs becomes part of the operator's cost. When an operator receives a quotation based on estimated quantities as computed by a wholesaler, is there any assurance, asks Mr. Mansell, that the wholesaler has not overlooked something or is there not a little clause stipulating that the price is for the equipment with errors and omissions accepted?

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

POSITIONS OPEN

DESIGNING ELECTRICAL ENGINEER.—Designing engineer familiar with electrical apparatus needed in connection with control and regulation of oil-burning apparatus. Address Box 61, care Heating and Ventilating Magazine.

DESIGNING HEATING ENGINEER.—A man fully competent to design steam-coil water tank heaters and who has had practical experience in this line. To such a man (preferably with some capital) a worth-while proposition is open, with the greatest coal-saving device ever devised, and about to be put on the market. Location, New York City. Address Box 62, care Heating and Ventilating Magazine.

POSITIONS WANTED

HEATING AND VENTILATING INSTALLATION SUPERINTENDENT.—Experienced man in heating and ventilating line wants steady position. Age 38. Address Box 63, care Heating and Ventilating Magazine.

MECHANICAL ENGINEER.—Experienced in laying-out, testing and operating fan-blast heating systems. Position with manufacturer or consulting engineer preferred. Address Box 64, care Heating and Ventilating Magazine.

ESTIMATING AND SALES HEATING ENGINEER.—Responsible position desired by man thoroughly experienced in estimating heating and power-plant work, having also outside training as sales engineer, and a good general knowledge and ability in connection with plan work. Can efficiently take charge of sales or estimating department. Address Box 65, care Heating and Ventilating Magazine.

HEATING ESTIMATING ENGINEER.—Have a broad, thorough training on all classes of heating, ventilating and power pipe estimating. Permanent position wanted with responsible concern. Address Box 66, care Heating and Ventilating Magazine.

PATENT AND PROTECT
Your valuable inventions
and
Register your trade marks.
Prompt attention. Superior Service
Lester L. Sargent, Patent and Trade Mark Attorney.
524 10th Street, Washington, D. C.

SOLD BY SUPPLY HOUSES

AUTOMATIC
HEAT REGULATION
ELECTRICALLY OPERATED

Packless Electric Valve

Whether it be for an isolated room or complete building, Gold's Control will give you that desired equable temperature. Energy derived from the 110 volt lighting current.

Write for General Catalog with Testimonials

Thermostat

GOLD CAR HEATING & LIGHTING CO.
BUSH TERMINAL
220 36th STREET BROOKLYN, N. Y.

Heating and Ventilation
STANDARD DATA SHEETS
SOME SUBJECTS

B. T. U. Losses
Ducts and Flues
Chimneys
Fittings
Pipe Covering
Flow of Steam in Pipes
One Pipe Steam Systems
Vacuum Heating Systems
Vapor Heating Systems
Gravity Water Heating

326 Sheets Covering 28 Important Subjects
Price 5 Cents per Sheet

Send for folder giving full list and special prices on sets and folder

Price for Entire Set, with Binder, $14.00

HEATING AND VENTILATING MAGAZINE CO.
1123 Broadway, New York City

STEAM TRAPS AIR TRAPS
STEAM SEPARATORS EXHAUST HEADS
OIL SEPARATORS BOILER ALARM WATER COLUMNS
STRAINERS

WRIGHT
WRIGHT-AUSTIN CO.

AUSTIN
DETROIT, MICHIGAN

—and 23 Silentvanes in —The Roosevelt— one of New York's most prominent hotels!

Photo, Courtesy American Architect

George B. Post & Sons, Architects; Meyer, Strong & Jones, Consulting Engineers; Thompson-Starrett Co., Contractors.

The Roosevelt Hotel finds proper ventilation a great asset in keeping its guests satisfied and comfortable.

40,746,000 cubic feet of air per hour is distributed throughout this beautiful building by twenty-three Silentvane Fans. Silventvanes are meeting the ventilating requirements in hundreds of other buildings throughout the country.

It has been little more than three years since Silentvanes were placed on the market. Today, over a thousand are in successful operation.

Silentvanes save on power and motor costs. The self-limiting horse power characteristic prevents motor overload, therefore it is unnecessary to provide a motor rating excessively greater than the fan load requires in operation.

Silentvanes develop the highest maximum efficiency ever secured from a centrifugal fan—83%. They run more quietly at higher speeds than any other types of ventilating fans on the market.

Specify "Sturtevant Silentvane" and Save Power!

B. F. STURTEVANT COMPANY

Sales Engineering Offices

Atlanta, Ga. — Los Angeles, Cal.
Boston, Mass. — Minneapolis, Minn.
Buffalo, N. Y. — Montreal, P. Q.
Camden, N. J. — New York City
Chicago, Ill. — Pittsburgh, Pa.
Cincinnati, Ohio — Portland, Ore.
Cleveland, Ohio — Rochester, N. Y.
Dallas, Tex. — St. Louis, Mo.
Detroit, Mich. — Salt Lake City, Utah
Denver, Colo. — San Francisco, Cal.
Hartford, Conn. — Seattle, Wash.
Indianapolis, Ind. — Toronto, Ont.
Kansas City, Mo. — Washington, D. C.

Plants located at

Hyde Park, Mass. — Berkley, Cal. — Camden, N. J.
Sturtevant, Wis. — Framingham, Mass. — Galt, Ontario

Sturtevant
PUTS AIR TO WORK

Foreign Representatives

American Trading Co. — Tokio
American Trading Co. — Shanghai
Catton Neill Eng. & Mach. Co., — Manila
H. P. Gregory Co., Ltd. — Sydney
Honolulu Iron Works Co., — Honolulu, T. H.
Blair, Reed & Co., Ltd. — Wellington
Wesselhoeft & Poor — Caracas
Wesselhoeft & Poor — Bogota
General Machinery Co. — Tampico
Pedro Maritino, Inc. — Lima
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A. E. Barker — Johannesburg

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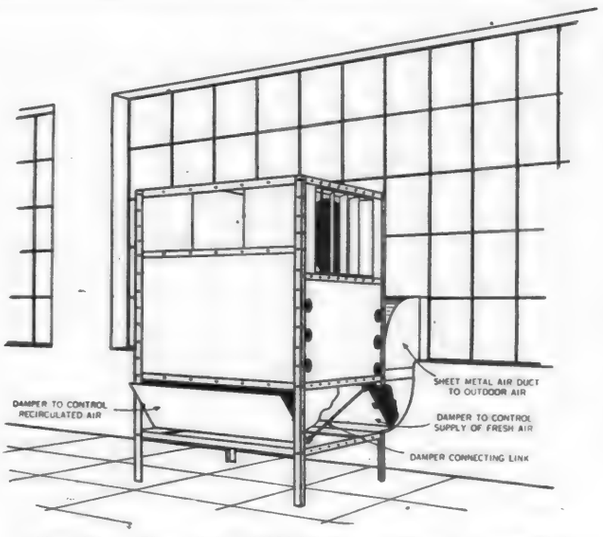

SHEET METAL AIR DUCT TO OUTDOOR AIR
DAMPER TO CONTROL RECIRCULATED AIR
DAMPER TO CONTROL SUPPLY OF FRESH AIR
DAMPER CONNECTING LINK

Sketch showing the TWINFAN unit heater arranged for ventilating purposes. The fresh air intake connection may be made through a window as shown, through the wall of the building or through the roof.

The Twinfan Heating Unit "Works" the Year 'Round

SUPPOSE you were responsible for the operation of a big industrial plant heated by direct radiation.

About this time of the year all the discomforts and inefficiencies which showed up in the system during the past winter would be fresh in your memory. And you'd probably be wishing you could throw out all that radiation to release the space it occupies for productive work during the summer months.

Suppose a heating and ventilating contractor came to you just then and showed you the saving you could effect in heating next winter with the Twinfan System and ALSO the application of this same equipment as a ventilating system during the hot months. Incidentally he could point out that the Twinfan Unit occupies much less floor space than direct radiation and does not prevent the full use of space immediately adjacent to the heater as in the case of floor radiators.

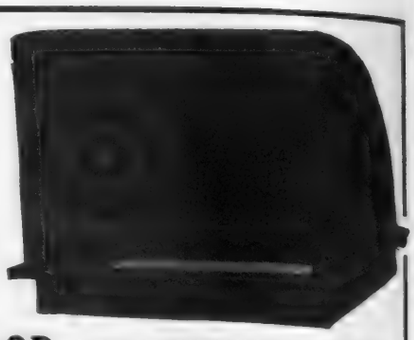
You'd listen with interest to such a story, wouldn't you? Chances are you'd act on his suggestion, too.

The point is that there are doubtless many industrial concerns in your territory in this supposed position right now. May we help you sell them?

TWINFAN SYSTEM OF HEATING

DWYER EQUIPMENT COMPANY
4534 W. NORTH AVE. CHICAGO, ILL.

TWINFAN SYSTEM OF HEATING



KNOWLES AISLE HOOD AIR DEFLECTORS

are placed under the aisle seats only, to throw fresh air out into the aisles in one direction. No draughts.

Delivers a large volume of fresh air with a small number of diffusers.

This means a big saving in the cost of duct construction.

The Knowles "AISLE HOOD" has a curved regulating damper, which can be locked in any position, by top screw. Two sizes—75 and 100 C.F.M. at 300 Vel.

Besides the AISLE HOOD, we manufacture several other styles of ventilator heads; the NOTCH type, the CAMELBACK and GALLERY RISER VENTILATORS. This enables us to meet the particular requirements of your building. Have you a set of blueprints of these models? Your name on a letterhead will bring them.

Knowles Mushroom Ventilator Company
202 Franklin Street New York City

—and a profitable business too!

Besides rendering a good service to your customers, there is also a profitable business in handling **C. S. B. APPROVED SPRINKLER HEADS.**

They can now be bought from us direct either separately or with all the other necessary equipment for sprinkler systems. Use your own pipe and your own crew and get the business.

Also, after a fire, sprinkler heads have to be replaced. A stock should be kept on hand for demands of this nature.

Write us for prices and details. We cooperate with you in every way.

C. S. B. SPRINKLER CO.
54 Batterymarch St. Boston, Mass.
Factory: Laconia, New Hampshire
Canadian Representatives: L. E. Moulton Co., Inc.,
142 Inspector Street - - - - Montreal, Canada

Clean Air for Office Buildings

Clean air is fully as essential in office ventilation as fresh air. If you have any doubts as to the harmful effect of atmospheric dust and bacteria look up the medical literature on the subject. There are reasons of economy and efficiency, too, similar to those that are leading to the installation of air cleaning equipment in practically every type of building.

Midwest Air Filters have thoroughly proven their superiority for this purpose, particularly in the ventilation of office buildings. 1924 and 1925 sales cover every section of the country —both in large cities and in smaller ones.

Here are a few representative buildings from the list:

California Packing Corporation	**San Francisco**
Castle & Cook Building	**Honolulu**
Johns-Manville, Inc.	**Boston**
Grinnell Building	**Detroit**
Nugents Building	**St. Louis**
New York Stock Exchange	**New York**
Insurance Company of North America	**Philadelphia**

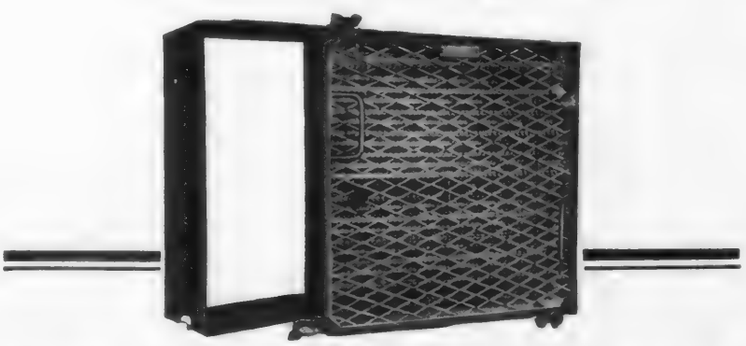
Have you investigated Midwest Window Ventilators—the self-contained ventilating units for individual offices and smaller rooms? Dept. F4 will gladly send details.

MIDWEST AIR FILTERS

INCORPORATED
100 EAST 45TH STREET
GRAND CENTRAL TERMINAL BLDG.
NEW YORK, N.Y. U.S.A

Midwest Canada Limited
83 Craig St., West
Montreal, Canada

Midwest Air Filters Pacific, Inc.
Monadnock Building
San Francisco, California



Outstanding Features of the New Model Type U2 Filter

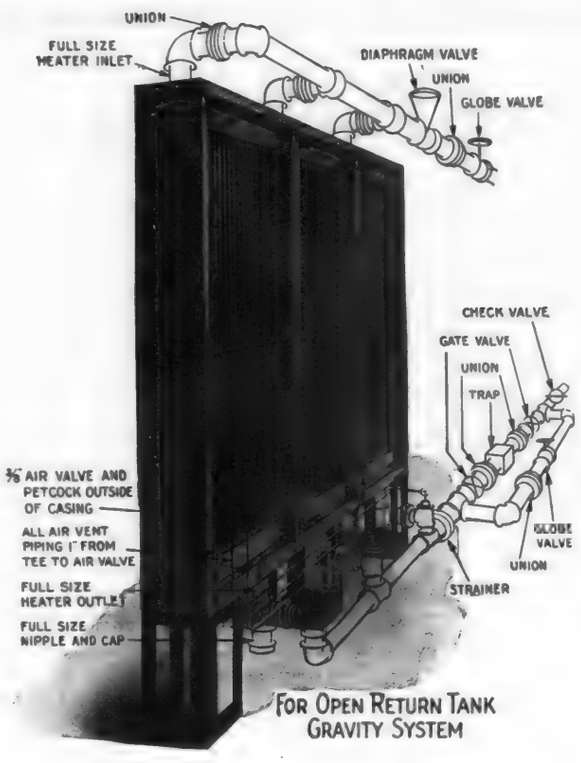
An installation is built up of standard interchangeable units, (a frame and filter cell 20" x 20" x 6½" overall, with a capacity of 800 C.F.M. per unit.) A positive air-seal is provided between each cell and frame and between adjoining frames on all sides.

The unique Midwest baffle-impingement principle makes these filters the most efficient air cleaners in existence. The filter medium consists of a series of specially shaped and perforated metal sheets coated with a sticky viscous fluid. Dusty air in passing through the filter cell, is forced to change its direction innumerable times.

Dust particles are impinged against the sticky surfaces of the filter sheets, where they are caught and held.

A series of specially designed sheets of knitted metal mesh are provided at the rear portion of the cell, on which fine dust particles which might pass the first filter sheets are impinged and caught.

Midwest Air Filters do not clog up. Any one cell of an installation requires cleaning only once every 6 to 8 weeks. With routine cleaning a constant resistance of ⅜" water gauge is maintained. With this performance is coupled a cleaning efficiency unsurpassed by any other filter on the market.



AEROFIN

Fan-System Heating Surface

TO ENGINEERS AND ARCHITECTS:

Aerofin Saves Space and Weight.

The light weight and non-corrosive features of Aerofin, together with its unit construction, space saving and because it comes to the job already encased and ready for steam connections, demonstrates its superiority, and for this reason we believe Aerofin merits being incorporated in your specifications. SINCE THERE IS NO EQUAL TO AEROFIN, WHY NOT SPECIFY IT OUTRIGHT? At least, we ask you to specify Aerofin as a standard and to figure out the exact sizes and number of units required so that the contractor will know what to figure on.

TO THE CONTRACTOR:

SAVE TEN CENTS PER FOOT OF HEATING SURFACE by erecting the (completely encased) Aerofin Units in the same number of HOURS as you would need DAYS to erect the heavy heaters.

SAVE MORE MONEY with Aerofin on account of the smaller number of steam and return connections required.

DON'T FORGET the saving in freight and cartage.

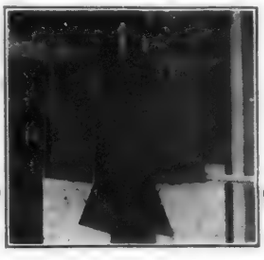
No extra reinforcement of the building construction required with Aerofin—may be suspended from ceiling with small angles and rods, without expensive platforms—may be handled with only ordinary care and assembled without using any block and tackle or scaffolding.

These features demonstrate that you can really save money by installing Aerofin altho the first cost, f. o. b. factory, may be a trifle higher than that of other fan-system heaters.

Illustration shows the ease with which several units high or wide of Aerofin may be assembled together by simply bolting thru the template punched flanges.

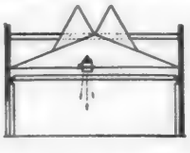
Aerofin Is Sold ONLY by Manufacturers of Nationally Advertised Blower Heating Apparatus

AEROFIN CORPORATION
750 Frelinghuysen Avenue
Newark, N.J.
L. C. Soule, *Sec'y and Chief Engineer*



Wing Featherweight Unit Heaters Heat with Less Steam!

With Wing Featherweight Unit Heaters installed overhead and out of the way, heat cannot accumulate at the ceiling where it is not needed and is therefore wasted, because the air from the upper portion of the building is being continually exhausted by the heaters—not to the outside atmosphere as with exhaust fans—but back to the working level, the part of the building you are interested in heating. This results in a considerable economy.
One user proves this very definitely when he writes, "We heated 50% more building with practically no more steam." Besides the above economy affecting the coal pile, placing Wing Heaters over head instead of on the floor leaves every square inch of valuable floor space available for the uses for which the building is intended.



This cut shows a unit located above a traveling crane 30 feet from the floor. A perfectly heated building resulted from this installation.

L.J. Wing Mfg. Co.

Fans and Blowers — *Damper Regulators*
Unit Heaters — *Small Turbines*

Hudson and 13th Streets — New York City

CENTRAL STATION STEAM CO.

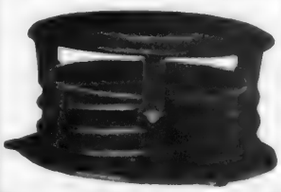
2912 East Woodbridge St.
DETROIT, MICHIGAN

MANUFACTURERS OF
Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.

For VENTILATION use LYON Toad Stools

They are Vent Caps of great strength, unobstructed throat, rigid non-rattling construction. The adjustment is from full open to full closed. The height of the floor member prevents sweeping dust and refuse into them. Their efficiency and economy make them particularly adaptable for theatres, auditoriums, etc.



Send for table of capacities and velocities

LYONS PRODUCTS COMPANY
710 Union Trust Bldg.
CHICAGO ILLINOIS

Announcement

To The Heating Contractors of America

THE policy here announced is one which will govern the American Blower Company and its entire sales organization in the handling and further development of business on Venturafin Unit Heaters and will be of immediate interest to the entire heating trade.

For the past three years, the American Blower Company has been proving and developing the market for its Venturafin Method of Heating. Due to the basic soundness of the Venturafin Principle and the many immediately evident advantages embodied in the Venturafin Method, most unusual success has been met in solidly establishing this heating element in a very short space of time.

The large number of Venturafin installations in successful operation is impressive evidence of the wonderful reception accorded the Venturafin Heating Method the country over.

The preliminary work, which is the responsibility of the manufacturer, has now been carried to a point where it becomes possible to announce the policy under which the future development of the rich Venturafin market will be conducted.

It will be the policy of the American Blower Company, based on the very pleasant relations with heating contractors that have always existed in the past, to devote the best efforts of its selling organization to encouraging the sale of Venturafin Unit Heaters through the heating contracting trade.

This policy is in line with the long established basis of American Blower operation, which has called for the distribution of the company's product, wherever possible, through existing regular trade channels.

Definite plans which will make the Venturafin Method of Heating a highly profitable, practical and attractive source of business to the contracting trade will be distributed very shortly. The thorough preliminary work that has been done establishes beyond question that an exceptionally acceptable heating method is being submitted to the contractor. Policy, plans and product are all, we feel assured, well deserving of the support and co-operation of the entire heating contracting trade.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO
[449]

American Blower
"Sirocco"
VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
Manufacturers of all Types of Air-Handling Equipment — Since 1881

Lengths to meet all Requirements No DECKING

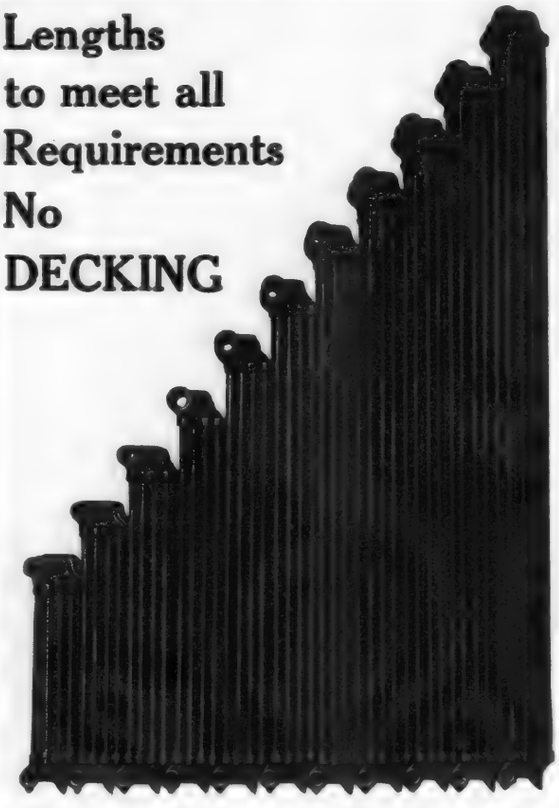


Illustration showing different heights of Lyon Heaters—made in steps of 10 inches from 40 inch to 140 inch lengths.

Lyon Interlocking Heaters for Hot Blast

Steam Pressure Range—0 to 120 lbs. Guaranteed.

All Prime Heating Surface With Greater Efficiency.

Being closely assembled they take up less space.

Their light weight requires no expensive supports.

Made of full strength Spellarized Steel pipe.

Substantial Headers and Bases of semi-steel.

Prices compare favorably and saving made on freight.

Valuable Data FREE Our 68 page catalog containing over 70,000 result figures of data on final temperatures and condensations from certain intake temperature and velocity, mailed free to Engineers, Architects and Contractors of record—write for it.

LYON PRODUCTS CO., Inc.
7 So. Dearborn Street Chicago, Ill.

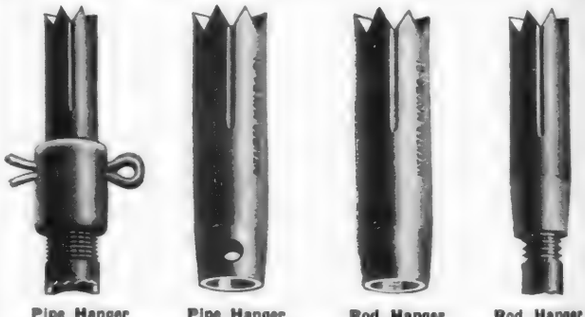
CROWN FUEL SAVER
and SMOKE *Consumer*

The CROWN Fuel Saver assures steady heat and plenty of it on the minimum of coal. For more than 10 years the CROWN has met the test in severe New England winters—and has likewise kept homes comfortably warm in the "below-zero-blizzard" weather of Montana.

Heating engineers are invited to write for full details of this remarkable heat-producer and coal-saver. There is special demonstration price to heating engineers and a guarantee of 20% coal saving.

CROWN FUEL SAVER CO., 70 N. 10th St., Richmond, Ind.

Fits the feed door of any heating plant, steam, warm air, hot-water



Pipe Hanger Shell | Pipe Hanger Shell | Rod Hanger Shell | Rod Hanger Shell

An Expansion Shell that Drills Its Own Hole

Phillips Spring Hammer

Where fastenings are to be made in concrete ceilings and walls, all trouble and inconvenience of drilling holes with drills is eliminated by the use of

Phillips Self-Drilling Expansion Shells

Simply drill into concrete with shell, which makes a perfect fitting hole. Shell is expanded with a few blows of the hammer and you're ready to hook on the load.

Phillips Drill Company
1537 Cortland St., Chicago, Ill.

¶ Bureau of Standards Laboratories. ¶ Agricultural Department Laboratories. ¶ United States Government Buildings, Washington, D. C. ¶ Uniform temperatures essential to scientific investigations carried on in these buildings.

Performance—not claims—won here

After a thorough investigation the Powers System of Temperature Control was installed in these buildings—the sole determining factor being ACCURACY and DEPENDABILITY of control.

A Fundamental Difference

Excessive use of compressed air in a temperature regulating system introduces large quantities of dust and moisture into the system which results in clogging, and corrosion of air lines and mechanism. These troubles, which cause inaccurate control and frequent repairs, are eliminated in the Powers System. It uses 90 per cent less air than other systems. In Powers Thermostats there are no finely restricted air passages or leak ports, no motion multiplying devices which need frequent adjustment and repair.

This is only one of the fundamental differences between Powers systems and Low First Cost Systems of Control and accounts for the practically perfect performance of the Powers System.

Lowest in Cost per Year

A Powers System commonly gives 18 to 25 years of ACCURATE, DEPENDABLE Service, with practically no expense for repairs or adjustments. Our booklet, "The Elimination of Heat Waste" shows how and why Powers Systems are "lowest in cost per year." May we send you a copy?

THE POWERS REGULATOR COMPANY

34 years of specialization in temperature control

(2197)

2718 Greenview Ave., Chicago

Atlanta	Charlotte, N. C.	Detroit	Los Angeles	New York	San Francisco	Seatt'e
Baltimore	Cincinnati	El Paso	Milwaukee	Philadelphia	CANADIAN OFFICES	
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Millions will read about AIRID this year

IT'S coming—the most aggressive campaign ever run on Airid Air Valves!

Your own customers in your home town are going to learn that it is no longer necessary to fuss with old fashioned valves.

With the first touch of frost, next fall, you can begin to cash in on the ever increasing demand for this American Radiator product.

At your jobber or from our nearest branch
Made and guaranteed by

AMERICAN RADIATOR COMPANY
IDEAL Boilers and AMERICAN Radiators for every heating need
1807 Elmwood Ave. Dept. S Buffalo, N. Y.

Owners
BOARD OF EDUCATION,
Pittsburgh, Pa.

DAVID B. OLIVER HIGH SCHOOL
PITTSBURGH, PA.

Heating Contractor,
R. T. WITHERS SONS CO.
New Castle, Pa.

This Fine New Pittsburgh School Equipped with Buckeye Fans and Buckeye Heatovents

Buckeye Products are the logical choice of a great many engineers and architects for fine buildings such as this, and we are proud to add this new high school building to our long list of installations.

Our equipment, backed by fifty-one years' experience in the heating and ventilating field, is being installed in a large number of both new and old buildings.

The coming vacation period provides an ideal opportunity of replacing your old heating system with the new, modern, economical and health promoting Heatovent System. The Heatovent is very flexible, easy to install, simple to operate, and requires very little floor space. Old buildings in which no means of ventilation have been provided, can be readily and easily equipped with the Heatovent System.

It will pay you to investigate the improved Heatovent System of ventilation and learn its many advantages.

Buckeye Blower Company

Columbus, Ohio

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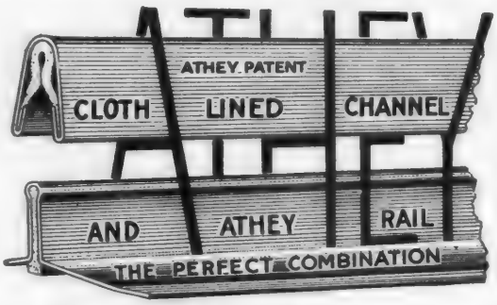
1400 Broadway, New York, N. Y.
Fales Building, Seattle, Wash.
458 East Church St., Elmira, N. Y.
1226 California St., Denver, Colo.

813 George St., Baltimore, Md.
709 Columbia Bldg., Pittsburgh, Pa.
1236 Callowhill Street, Philadelphia, Pa.
210 Dooly Bldg., Salt Lake City, Utah
405 Sharon Bldg., San Francisco, Calif.
Rose Building, Cleveland, Ohio

$3,432 worth of coal *saved* in one year by



Cloth-lined Metal Weatherstrip

In a big building on Chicago's lake front, the installation of Athey Cloth-lined Metal Weatherstrip saved 572 tons of coal in one heating season. At an average of $6 a ton for coal that means a saving of $3,432. Yet the cost of installing the Athey strip was less than $5,000. The name of this building, and the Engineer who furnished this data will be given anyone interested, upon requested.

And this figure does not include the saving of labor in the handling of the smaller amount of coal and ashes; the saving in cleaning charges because Athey strip really kept out the dust and dirt—nor the elimination of complaints from tenants, which up to that time had been numerous. Tenants were "kicking" and threatening to move. The architect and Engineer recommended Athey Cloth-lined Metal Weatherstrip—and everyone was happy.

The Athey is the only cloth-lined metal weatherstrip made. It is impossible to fit two pieces of metal close enough to keep out drafts and dust *without making windows stick*. In the Athey strip the metal rail runs ***smoothly*** and ***easily*** in a metal channel ***lined with cloth.*** The cloth hugs the rail so that drafts, dust and noise can't get around it. Yet the windows open and close easily. That is why Athey Cloth-lined Metal Weatherstrip is being used on so many of America's finest buildings.

Athey Company

6067 West 65th Street - Chicago, Illinois

Improved Rotary Type 22

This cut shows a complete installation of Underground Oil Storage Tank-Piping and Johnson Improved Rotary Oil Burners. Note—How Simple—and Safe. Can be readily installed in most any Boiler Heater or Furnace. Patented features of Centrifugal Atomization permit the cheapest grade Fuel Oil to be pumped and burned with high economy and satisfactory service—Listed as standard by Underwriters' Laboratories.

Write for Our Latest Bulletin No. 28D, describing and listing this Oil Burner Masterpiece.

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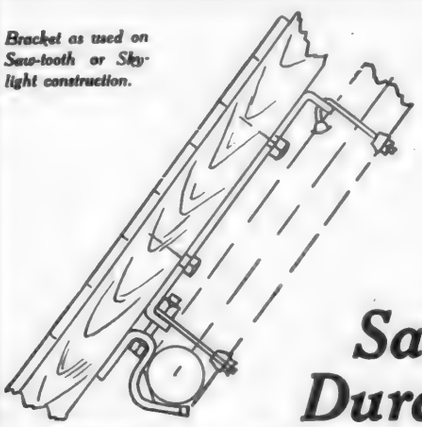
S. T. JOHNSON CO.,
OAKLAND, CAL.

Distributors and Branches
San Francisco, New York, Chicago, St. Louis, Philadelphia, Detroit, Dallas, Los Angeles, Indianapolis, Portland, Seattle, Milwaukee, Louisville, Bridgeport, Paterson, Sacramento, Buffalo, Toronto, Montreal, Cleveland, Hull, Fresno, Kansas City, Oklahoma City, Honolulu, Minneapolis, Washington, New Orleans, Miami.

Bracket as used on Saw-tooth or Sky-light construction.



No. 2 for Horizontal Wall Radiator

Safe Durable Convenient

These qualities are built into Gleockle Wall Radiator Brackets because they are made by men who know bracket requirements.

They are also adjustable, easy to erect, inexpensive, invisible after erection, and will fit any make of wall radiator.

Patented

Let us send you descriptive booklet and trade discounts.

A. F. GLEOCKLE, Jr. 415 Bay Street ROCHESTER, N. Y.

REED AIR IS CLEAN AIR

3 State Street Stores
Use REED CLEAN AIR

FREE BULLETINS

These bulletins, with convenient, self-filing covers, are made to fit your files. Send for any or all of them.

No. 106—*The Reed System of Air Filtration.*

No. 107—*Data, Tests and Specifications.*

No. 108—*Reed Air Filters for General Ventilation.*

(*REED AIR FILTERS are covered by patents of May 16, 1922, Feb. 12, 1924, Nov. 18, 1924. Other patents pending.*)

THREE of Chicago's well-known stores, Carson, Pirie and Scott, Mandel Brothers and The Fair, use Reed Air Filters to protect physical property and physical health. In each instance Reed Filters represent a real, profit-paying investment by reducing costs of maintenance, protecting valuable merchandise and increasing the efficiency of employees.

Reed Air Filters are guaranteed to remove 97% of dust, soot and bacteria from the air and are easily installed in small space in connection with old or new systems. Let our engineers submit data and sketches free of charge.

REED AIR FILTER COMPANY, *Incorporated*
215 Central Avenue, Louisville, Ky.
Offices in Principal Cities

REED AIR FILTER COMPANY, Inc.
Engineering Department
215 Central Ave., Louisville, Ky.
Gentlemen: Please send me without obligation Bulletins
Nos.....
Possible use.....C.F.M.
.....
Name.....
Firm.....
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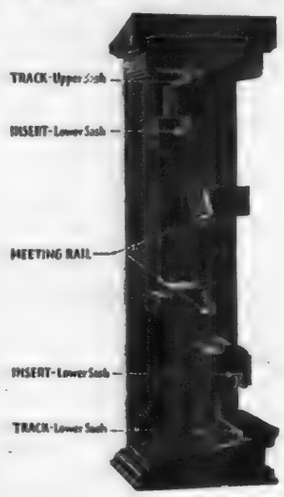
Reed Air
TRADE *filters* ALL METAL MARK

HIGGIN
ALL METAL
WEATHER STRIPS



The patent *Insert* strip makes Higgin Weatherstrips extra draft-tight

Higgin Weatherstrips are the only all-metal strips with the self-holding spring flange **Insert** in the sash. This **Insert** is important.

It makes a perfectly draft-tight contact at every point. Swelling or warping cannot prevent accurate fit and closure.

Without the Higgin Metal Insert the wooden groove will wear, swell or shrink, causing sticking or allowing seepage of air through the apertures.

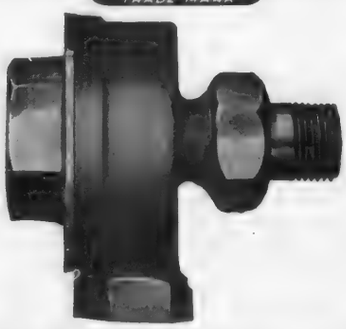
Higgin Strips are "Metal against metal all the way round." Higgin-equipped windows and doors always keep cold air out and warm air in, operate smoothly and easily, and never need refitting.

HEATING ENGINEERS! You can safely guarantee a definite heating efficiency for your equipment when Higgin All-Metal Weatherstrips are installed. They keep all the cold air out and all the warm air in. They never loose their close fit by warping or shrinkage of frames. Every job is installed by trained Higgin men and guaranteed by the Higgin organization. Recommend Higgin All-Metal Weatherstrips to your customers.

The **HIGGIN** *Mfg. Co.*
Newport, Ky.
Toronto, Canada.

Manufacturers of Higgin All-Metal Weatherstrips and Higgin All-Metal Screens

Sterlco
TRADE MARK



The Sterlco Thermostatic Trap

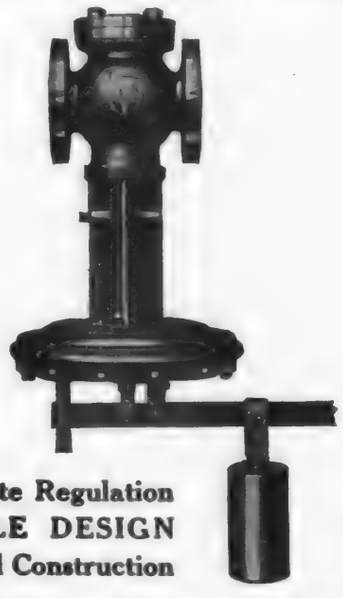
The radiator trap that makes satisfied owners and tenants.

The following are a few representative installations selected from our long list:

Elon College, Elon, North Carolina, 444 Traps.
N. W. Home for Disabled Soldiers, Milwaukee, Wis., 3300 Traps.
Methodist Protestant College, High Point, N. C., 270 Traps.
Weinbrenner Shoe Company, Milwaukee, Wis., 425 Traps.
Mayflower Hotel, Washington, D. C., 1000 Traps.
Hotel Stamey, Hutchinson, Kansas, 100 Traps.
Timpson School, Timpson, Texas, 92 Traps.
Toledo Municipal Hospital, Toledo, Ohio, 161 Traps.

STERLING ENGINEERING CO.
1630-44 Holton St. Milwaukee, Wis.
Representatives in all large cities.

USE A MASON
Lever Style Reducing Valve
on your next
HEATING CONTRACT



Accurate Regulation
SIMPLE DESIGN
Rugged Construction

MASON REGULATOR COMPANY
Boston, Mass. San Francisco, Cal. Montreal, Canada

The Universal Unit Ventilation System

GUILBERT & BETELLE, *Architects*
Associate Architect
ARNOLD H. MOSES

GLASSBORO STATE NORMAL SCHOOL
GLASSBORO, N. J.

Engineers
R. D. KIMBALL CO.

THIS IS ONE OF MANY TESTIMONIALS FOUND IN OUR INSTALLATION BOOKLET

May We Send You A Copy?

NEW JERSEY STATE NORMAL SCHOOL
GLASSBORO
J. J. SAVITZ, *Principal*

Dear Mr. Nesbitt: February 13, 1924

In reference to your communication I would say that the heating units established in this school by your firm are entirely satisfactory. There is no noise, there is plenty of fresh air, and the rooms are well heated. I am so enthusiastic about your system that I am willing to recommend the installation of this system most heartily and would certainly have it installed in any building I should build.

Yours very truly,
J. J. Savitz

S/B

JOHN J. NESBITT, INC.

213 NORTH VERMONT AVE., ATLANTIC CITY, N. J.

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DENVER, COLO.
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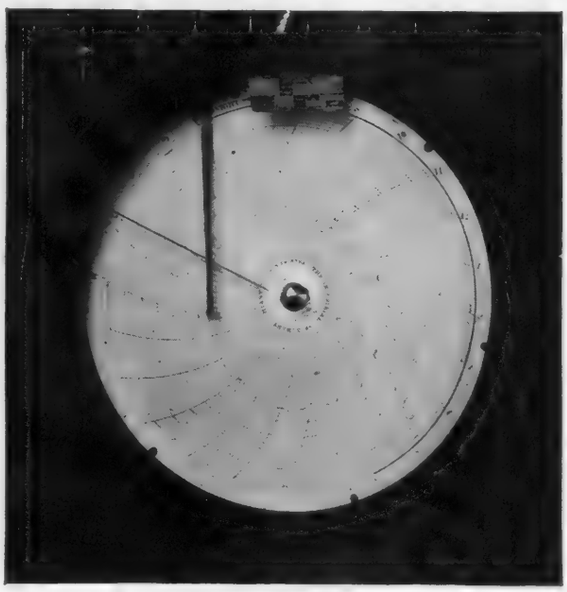
SEE OUR CATALOGUE IN SWEETS



Foxboro Recording Thermometer

The Frankfort Heating Co. Uses Foxboro Instruments

The Foxboro Recording Thermometer shown above is but one of several Foxboro instruments installed at the plant of the Frankfort Heating Company, Frankfort, Indiana.

This 12 inch Recording Thermometer records the temperature of water supplied to the mains for heating office buildings, factories and residences.

Other Foxboro Instruments record outside temperatures, temperature of return water and are used in the boiler room.

You will find Foxboro Instruments installed in the biggest central heating stations, office buildings, banks and power plants in the country.

If you are interested in accurate, dependable instruments for indicating, recording and controlling temperature, pressure or humidity write to Dept. R for complete information.

THE FOXBORO CO., Inc.

Neponset Avenue, Foxboro, Mass., U. S. A.

New York Chicago Boston Philadelphia Pittsburgh
Cleveland Rochester Birmingham Tulsa
Los Angeles San Francisco Portland, Ore.

FOXBORO

REG. U. S. PAT. OFF.

THE COMPASS OF INDUSTRY 164

BOOKS ON HEATING AND VENTILATING

MECHANICAL EQUIPMENT OF FEDERAL BUILDINGS. By Nelson S. Thompson. Third revised edition, covering the basic data used by the Treasury Department in the design of the entire mechanical equipment of Federal Buildings under its control. Includes data on heating and ventilating, plumbing, drainage and water supply systems, gas piping, conduit, and wiring systems, lighting fixtures, elevators, small power plants, motors and controlling apparatus, vacuum cleaning systems, operating data, etc. Size 6 x 9 in. 400 pages. Cloth $4.00.

PLUMBERS' HANDBOOK. By Samuel E. Dibble. This work contains valuable data for the heating engineer and estimator, architect, building contractor and sheet metal worker, as well as for the plumber. Each subject is treated by a specialist, the section on Pipe Standards and Pipe Dies by F. N. Speller and that on Heating by Alphonse A. Adler. Size 4 x 7 in. 629 pp. 316 ills. Cloth, $4.00.

MECHANICAL EQUIPMENT OF BUILDINGS. Vol. 1. Heating and Ventilation. By Louis A. Harding and Arthur C. Willard. One of the most complete treatises ever published on this subject. Written for the practicing engineer, as well as for the student. Size 7 x 9½ in., flexible binding. 621 pages and profusely illustrated. Price $6.00.

Vol. II. Power plants and Refrigeration. An equally complete treatise, illustrating and describing in detail modern power-plant design and refrigerating practice. Size 6¾ x 9¼ in., flexible binding. 766 pages, many illustrations. Price $6.00.

Vol. III. Miscellaneous Building Equipment in preparation, including lighting, elevators, vacuum cleaning, sprinkler systems, plumbing, etc.

HEATING AND VENTILATION. By the late John R. Allen and J. H. Walker. This is the second edition of this work and has been brought up to date in every particular, including the latest radiator transmission factors put out by the Research Laboratory of the A. S. H. & V. E. and the Hill synthetic air chart testing method. Especially adapted for use as a text book. Size 6 x 9 in. 322 pages Cloth, $3.50.

STEAM PIPING ITS ECONOMICAL DESIGN AND CORRECT LAYOUT. By A. Langstaff Johnston, Jr. An analysis of the factors governing the flow of steam in pipes with numerous large curves for use in solving the problems of practical installation and determining the most economical size of pipe for any given set of conditions. Pp. 62. Size 5 x 7½ in. Cloth, $2.00.

DESIGNING, HEATING, AND VENTILATING SYSTEM. By Charles A. Fuller. A treatise on the practical application of the engineering rules and formulas in every day use, in laying out steam, hot water, furnace and ventilating equipment for buildings of all kinds, presented in a simple manner. Price $3.00.

STEAM POWER PLANTS: Their Design and Construction. By Henry C. Meyer, Jr., M. E. Third edition, fully revised. One of the standard works on the design and construction of power plants. Covers proportioning boilers, selection and writing specifications for steam engines, selection and arrangement of auxiliaries, construction of chimneys, coal handling, etc. 219 pages. Size 6 x 9 in. Illustrated with folding plates. Price, $2.00 postpaid.

PRACTICAL STEAM AND HOT WATER HEATING. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.50.

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THE HEATING and VENTILATING MAGAZINE
1123 BROADWAY, NEW YORK

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They have 15 Buffalo-Carrier Units.

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One of the satisfactions derived from our business is the knowledge that we are contributors to the nation's health.

Each normal person breathes 32 pounds of air in twenty-four hours. Indoors, it is vitally important that this air be fresh and pure and supplied in abundance.

Carrier air washers and Buffalo fans and heaters are supplying clean, tempered air in hundreds of buildings where people gather—schools, offices, factories, theatres, hotels and public buildings.

In many cases, we receive actual reports of the spread of sickness through a building when the "Buffalo-Carrier" apparatus is shut down for a few days, thus giving actual proof of its healthful value.

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7 Jewels

Every day is a bigger day for the new Model 77 Minneapolis Heat Regulator. Its success has been phenomenal—the result of true engineering achievement combined with moderate price.

Here is a model which advances still further the nation-wide leadership of

The "MINNEAPOLIS" HEAT REGULATOR

"The Heart of the Heating Plant"

An outstanding feature of the new Model 77 is that the entire tripping mechanism is contained in the clock. This makes it simpler, more accurate, more dependable. Here is a clock—8 day 7 jewel—requiring the very minimum of attention. It's Minneapolis-made, built for its job, in a plant that is one of the model clock factories of America.

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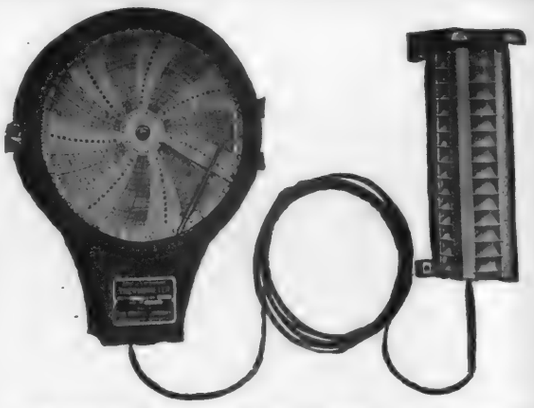

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This is particularly suitable for apartment houses, hotels, public buildings including schools, theaters, municiple, etc.

By knowing the outside temperature at all times the engineer is able to regulate the indoor temperatures more closely.

Ask for copy of Bulletin No. N-303.

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The diaphragm is made of the toughest and most flexible material that can be obtained. There is no movement of metal where the joint is made up. The only joint is at the edge. This is three-eighths inch wide, reinforced by seamless drawn tubing.

The plates that cover the top and bottom so reinforce the diaphragm that it cannot be ruptured or distorted by any excess steam pressure.

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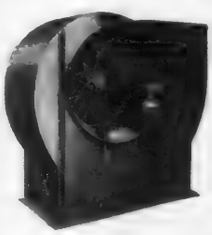
The New Mercy High School, Chicago, completed Sept. 8, 1924, at a cost of one million dollars, is representative of the best in modern educational structures. Its designing is a splendid testimonial to the genius of the architect—Mr. Joseph W. McCarthy.

The middle section of the building contains reception rooms, offices, library, study hall and a gymnasium covering an area of 90x64 feet. Pure, washed air is supplied to the gymnasium by a Bayley No. 10 Plexiform Fan and a Bayley No. 66 Turbo Air-Washer. Laboratories and class rooms in the north wing and the auditorium in the middle section, with a seating capacity of over one thousand are ventilated by a Bayley No. 13 Plexiform Fan and a Bayley No. 98 Turbo Air Washer. The first floor of the north wing contains a cafeteria and completely appointed kitchen, in which the air is kept pure and fresh by a No. 7 Bayley Plexiform Fan and a No. 55 Bayley Turbo Air Washer; surplus heat and fumes are exhausted from the Kitchen by a Bayley No. 7 Plexiform Fan.

The Mercy High School is one of many prominent educational buildings throughout the country where Bayley Equipment maintains pure air.



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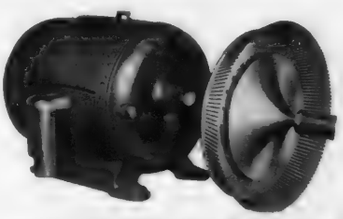
A sturdily built, light, easy running blast wheel that moves the greatest volume of air at low operating cost. Made in various sizes, either single or double widths engine, motor or lineshaft drive. Produces a maximum of air delivery, against low or medium high resistance, with a minimum power requirement.



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is based on the Turbo - Atomizer, consisting of a single fire type nozzle, which delivers the water to a spray wheel or rotor, where it is whirled centrifugally through the atomizing pins forming a dense, even curtain of water. This simple device with its single, large fire type nozzle will never clog and it operates at nominal water pressure at a power saving of 40 to 60% compared with fine orifice, high pressure multiple nozzle systems.

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HEATING AND VENTILATING
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IT IS IMPOSSIBLE TO METER OZONE ELECTRICALLY WHEN THE OZONIZER IS CONSTRUCTED OF MATERIALS SUBJECTED TO ATTACK BY OZONE AND ELECTRONIC BOMBARDMENT.

Aluminum and *Glass* are *unaffected* by dry ozone or electronic bombardment.

U. S. Ozonizers utilize only glass and aluminum for the interior construction of the ozone generator. All *organic* and *laminated* substances are strictly *excluded.*

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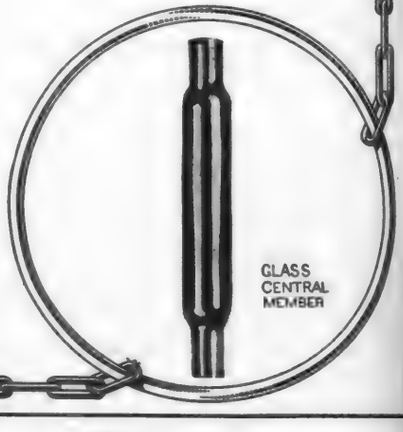

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A standard type of Crescent Thermometer specially designed for both warm and cold air ducts. 9 or 12 inch scale graduated as required. Union Flange and stem of required length.

Guaranteed accurate and reliable. Prices and Air Duct Bulletin F-14 on request.

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AIR CONDITIONING TRADE MARK

APPARATUS for maintaining artificial atmospheric conditions in industrial plants.

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MANUFACTURED WEATHER makes "Every day a *good* day"

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Chamberlin Efficiency Proved in Tests Made After Years of Use

COPLEY PLAZA HOTEL
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Fitted with Chamberlin Weather Strips 13 years ago. Test made April 10, 1925, showed 97.34% of possible in-leakage prevented by Chamberlin equipment. Wind velocity during test, 12 M.P.H. Actual leakage through windows, with 20:33 lineal feet of crack was 1.18 cu. ft. per minute.

Adolphus Busch Residence
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96.20% possible in-leakage prevented by Chamberlin strip installed in 1903—twenty-two years ago. With a wind velocity of 21 M.P.H., windows with 18.25 lineal feet of crack actually leaked only 2.51 cu. ft. per minute.

There are sound reasons why only Chamberlin, of all weather strip manufacturers, guarantees every installation for the life of the building.

This guarantee of life-long efficiency is based not on guess-work, but on actual tests made on buildings weather-stripped by this company during the past 32 years.

Chamberlin Metal Weather Strips installed on office buildings and homes, 10, 20 and 30 years ago are giving the same satisfactory service today as when first placed in position.

Architects and home owners are each year placing greater value on permanence in building design and construction.

It is important for them to know that Chamberlin Weather Strips, once installed by Chamberlin experts, need never be replaced.

The Chamberlin installation policy together with the effective design of the Standard Chamberlin Corrugated Strip, are given preference today, wherever greatest efficiency and value are considered.

CHAMBERLIN METAL WEATHER STRIPS
SINCE 1893-THE STANDARD

This advertisement is No. 3 of a series illustrating Chamberlin "Tests of Time"

"Chamberlin Metal Weather Strip Details" is the most complete book of its kind ever issued. Free copy sent to architects upon request.

Architects are invited to make free use of our nation-wide service organization. Estimates furnished without obligation.

CHAMBERLIN METAL WEATHER STRIP COMPANY, DETROIT, MICHIGAN

80 Sales and Service Branches Throughout the United States

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Safety-Vent Vapor Regulator

POWER IS ITS MIDDLE NAME

Makes any Vapor or Modulating System safe and satisfactory. Sensitive to the slightest change in pressure. Has ample power to control the dampers with a good working margin.

Full power of regulator is exerted within a pressure range of two or three ounces.

The Safety Vent Valve is a distinguishing feature of this regulator and takes care of air from entire heating system.

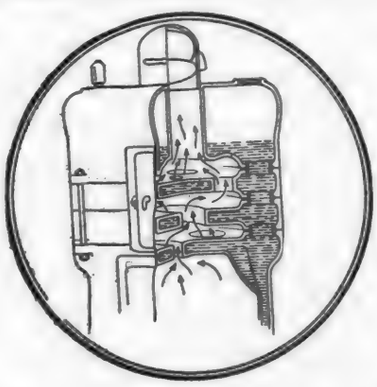
Tested and carefully adjusted before leaving factory, ready to be connected up and put into service, with the least trouble and expense.

All working parts of cast bronze. Will last as long as the boiler, or any other part of system.

Write for details

SIMPLEX HEATING SPECIALTY COMPANY, Inc.
LYNCHBURG, VA.

"Staggered Fire Travel"



Thatcher Round Boiler

No Waste Heat This Way!

PEOPLE who want the right kind of Steam or Hot Water Heat will be quick to grasp the advantages of the "Staggered Fire Travel" of Thatcher Round Boilers. The zig-zag arrangement causes the flames to "mushroom" between sections, in traveling from body to dome. There is no other method more satisfactory for quick heat at low cost.

THE THATCHER COMPANY
Formerly Thatcher Furnace Co.

Since 1850

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THATCHER
BOILERS-FURNACES-RANGES

GORTON VALVES

Quality

Determined the use of the Gorton Quarter Turn Packing Lock Radiator Valves in the following large and prominent buildings:

New 24 Story Pacific Tel. & Tel. Building, San Francisco, Calif.—900 Valves.

Matson Building, San Francisco, Calif.—485 Valves.

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Hudson View Garden Apartments—(14 Buildings) New York City—Over 1000 Valves.

Maryland Casualty Building, Baltimore, Md.—Over 500 Valves.

Many Others from Coast to Coast

Complete Details of EXCLUSIVE FEATURES of this QUALITY VALVE gladly furnished on request.

GORTON & LIDGERWOOD CO.
96 Liberty Street, New York, N. Y.
Established 1887
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Every other working day last year a carload of new cylinders was put into service for users of

Prest-O-Lite
DISSOLVED ACETYLENE

THE PREST-O-LITE COMPANY, INC.
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HEATING SYSTEM CONTROL FROM THE POWER PLANT

THE largest single hot water heating system in the world, located in New York City, serving a group of buildings of approximately eight city blocks, is regulated entirely from the power plant by hourly inspection of outside temperature and adjustment of the steam pressure in Wainwright heaters, and the speed of the Wheeler Alberger circulating pumps forcing the water through the heating system.

A single season's experience furnished the necessary data for predetermining the outgoing water temperature necessary for comfortable heating results at various outside temperatures and individual control of the thousands of radiators in hotel and office rooms served from this plant is entirely avoided.

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Crosshead-GUIDED Expansion Joint

Excels in

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
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ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.

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the damper regulator to be *Victor* or equal

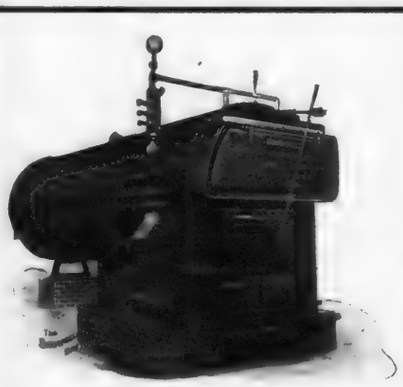
Always specify VICTOR and be assured of damper regulators that REGULATE. SOLD WITH AN ABSOLUTE GUARANTEE.

We make three sizes—for high, medium, and low pressures. For all services.

Complete list of Atlas Regulating Devices in classified directory, this issue.

The above is VICTOR NO. 3; for pressures up to 250 lbs.

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South St., Newark, N. J.



Brownell Return Flue Portable Heating Boiler—Smokeless Type

BROWNELL

Better Boilers for Heating and Power Purposes
70TH YEAR

of successful manufacturing experience. This is the reason why Brownell Boilers are specified by all the leading Heating and Contracting Engineers.

BROWNELL Steel Heating Boilers are
LOW IN FIRST COST
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BUILT TO LAST A LIFETIME

Our reputation is your insurance of a high quality product. Let us solve your heating problems. Sales representatives in all principal cities. Send for them.

THE BROWNELL CO.
DAYTON, OHIO

THE BROWNELL COMPANY — The World Over — DAYTON, OHIO, U.S.A.

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BOILERS

If you want
More profit per sale
Less service expense
More customers boosting for you

EVERY hot-water boiler will perform better with Automatic Regulation. This fact is so well established that many of the biggest contractors are now using ARCO Water Regulators on every job.

You could afford to give an ARCO Regulator away with every job, because your satisfied customers are your best salesmen. But you don't have to, because an owner will gladly pay the small cost of getting this relief from damper worries.

Sell an Arco Water Regulator with every hot water boiler

(Stock No. 800)
List Price, $18.00

For Domestic Supply Boilers
No. 801 Junior Regulator
List Price, $16.00

Stem transfers work from bottom of bellows distributing travel equally to each fold

One piece bellows made in our own factory

Design provides extra long temperature range—100 degrees to 220 degrees standard.

Filling tube provides positive method of sealing liquid chamber.

Volatile liquid develops pressure on outside of bellows. Gives durability, accuracy and sensitiveness.

You can get ARCO Water Regulator from your jobber or from our nearest branch

AMERICAN RADIATOR COMPANY

IDEAL Boilers and AMERICAN Radiators for every heating need

1807 Elmwood Avenue Dept. S Buffalo, N. Y.

KENNEDY

Extra Heavy Bronze Gate Valves

Fig. 40

These valves are particularly strong and efficient as well as very simple in construction. In operating, the first movement of the stem in opening clears the disc from the seats, and in closing, the disc makes no contact with the seats until the moment of closing.

A large non-heating wheel is used for convenience of operation, and the wheel is fastened to the stem by a nut, instead of having the stem merely peened over as in cheaper grades of valves.

These valves are fully described, together with the entire Kennedy line of over 4600 different types and sizes, in Catalog 45 which will be sent on request.

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MIAMI
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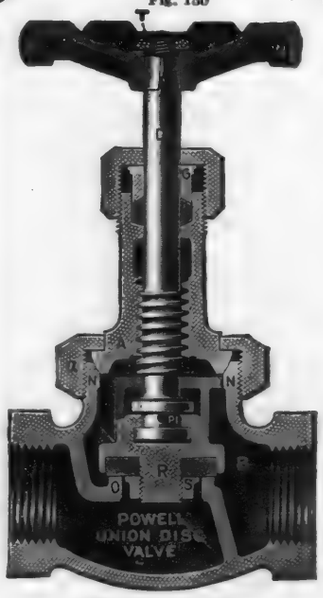
POWELL VALVES

Fig. 150



Sizes ⅛ to 3 inches

UNION COMPOSITE DISC VALVES

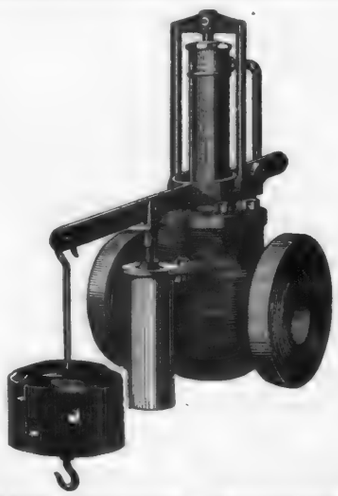
ALWAYS DEPENDABLE

For Hot Water or Steam Heating

Notice the Union Bonnet Connection

Ask your dealer for Powell Valves

The Wm. Powell Company
Cincinnati, Ohio



WHEN regulators of another design fail to give you the accurate service that the conditions demand—buy a Davis. A direct connected balanced disc—a frictionless piston—pressure balanced by weights. The natural result is accurate regulation.

G. M. DAVIS REGULATOR CO.
436 Milwaukee Avenue, Chicago
1875—Valve makers for fifty years—1925

DAVIS VALVE SPECIALTIES
STEAM SAVERS SINCE 1875

A Big Step Ahead

Forged Brass Tail Nuts Cut Down Installation Costs

TIME is money, and unforeseen delays often represent the difference between profit and loss.

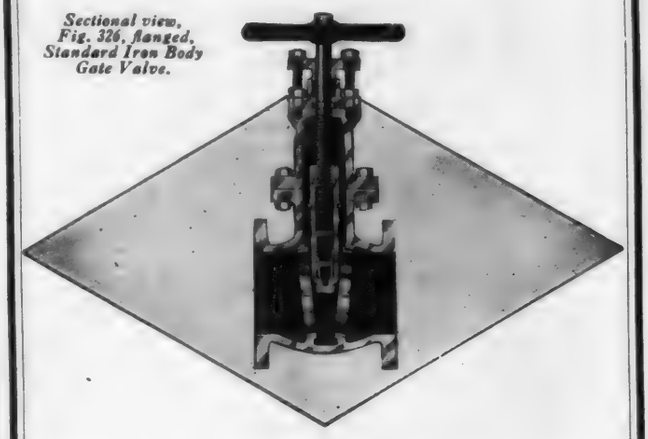
When using Commonwealth-Lavigne Radiator Valves you are insured against installation troubles by the forged brass tail nut which will not crack nor break. This feature has been given an enthusiastic welcome by steamfitters the country over.

The reputation of Commonwealth-Lavigne Radiator Valves for high quality is so firmly established with the trade that you know you will receive only first-class operation and service from them.

Your Jobber Can Supply You

COMMONWEALTH BRASS CORPORATION
DETROIT, MICH.

COMMONWEALTH
LAVIGNE
RADIATOR VALVES



Sectional view, Fig. 326, flanged, Standard Iron Body Gate Valve.

Extra sturdiness counts

Fig. 117 Screwed, Standard Bronze Horizontal Check Valve

Fig. 108 Screwed, Standard Bronze Angle Valve.

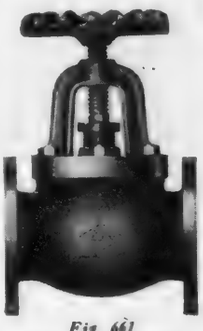


Fig. 661 Flanged, Standard Bronze Globe Valve, with bolted yoke and iron wheel.

When piping expands or contracts, lifts or settles, genuine Jenkins Valves have the extra sturdiness to make good where poorly constructed light-weight valves are bound to fail.

Reserve strength is built into a Jenkins Valve. Each is made for better-than-average service, and must pass tests to prove its fitness to bear the Jenkins "Diamond" mark.

It pays to install valves that uphold your reputation. There are genuine Jenkins Valves for practically every plumbing and heating service; make sure your men are using them.

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JENKINS BROS., LIMITED

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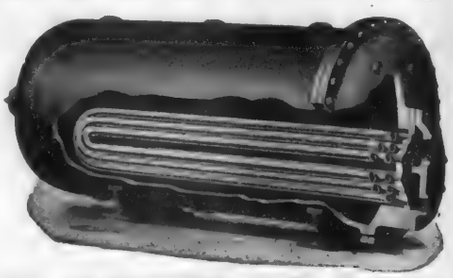
Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

"HOT WATER?
—They Get Nothing Else But"

"Honest, it's a cinch when you've got a NATIONAL Storage Heater. Hot water's always on tap by the pint or by the hogshead, but the NATIONAL sure goes light on steam and it's no trouble at all to keep it spick and span and on the job one hundred per cent."



Let us send you Bulletin 65

NATIONAL
U BEND TYPE
STORAGE HEATERS

The National Pipe Bending Company

120 RIVER STREET *Established 1883* NEW HAVEN, CONN

Canadian Representative: Grant E. Cole Company, Toronto, Ont. 8140

Less Than $1.50 a Year for Repairs

A No. 2 Taylor Boiler Feed Trap was installed in a steam laundry over fifteen years ago.

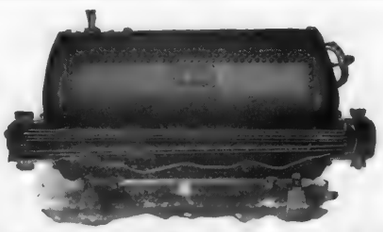
The repairs required by this trap, working under a pressure of 80 to 95 pounds, amounted to less than $10, or less than $1.50 per year.

This is a typical Taylor performance. Could there be a better recommendation?

Let us send details in full.

TAYLOR MACHINE WORKS

85 S. Monroe St., Battle Creek, Mich., U. S. A.

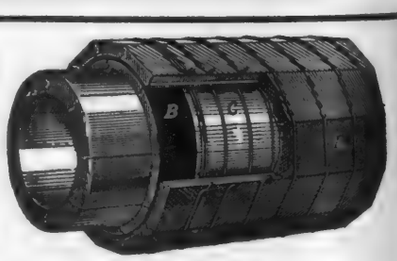


Alberger-Buffalo Storage Heaters have tubes the full length of tank which insures maximum heat transfer. Satisfaction guaranteed. Write for information on Alberger Multi Head Heaters and Howard Guided Expansion Joints.

ALBERGER HEATER COMPANY
HOWARD IRON WORKS

281-289 Chicago St. Buffalo, N. Y.

Wyckoff's Improved Cypress Covering



Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

A combination heater with combination advantages

The G-R Instanta Storage Heater combines the advantages of both the Instantaneous and the Storage Type Heaters without the limitations of either—

Operation:

1. Incoming cold water enters tubes of instantaneous heating element and is heated by the steam in instantaneous heater shell.
2. Water then passes through the exterior pipe to the storage shell.
3. The inner heater shell filled with steam keeps the stored water hot.

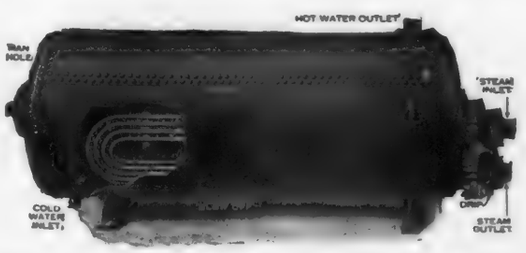
Advantages:

1. Instantaneous heating when required.
2. Tremendous overload capacity.
3. Storage of hot water against sudden draws.
4. Floating head construction—no strains.
5. Any tube replaced easily without disturbing others.
6. Less space and less piping than an instantaneous heater and separate storage tank.

Write for full information

THE GRISCOM-RUSSELL CO., 2155 West St. Bldg., New York

Offices in all Principal Cities



Patterson Combined Hot Water Service and Storage Heater—Type B.

Ready for Sudden Heavy Demands

This heater is adaptable to:

Clubs
Hotels
Apartment Houses
Association Buildings
Institutions
Bleacheries
Dye Houses
Canning Plants
Laundries
Paper and Pulp Mills
Textile Plants
Industrial Plants, etc.

Where the demands for hot water are not constant or where a large volume of water must be held in storage for sudden, heavy demands, the Patterson Combined Hot Water Service and Storage Heater fills the requirements. It operates with either live or exhaust steam—high or low pressure—automatically controlled, or in connection with low pressure, vacuum or vapor heating systems.

Our Engineering Service is offered without obligation, and the requirements of each installation are considered carefully before making recommendation as to type or capacity of the heater to be used.

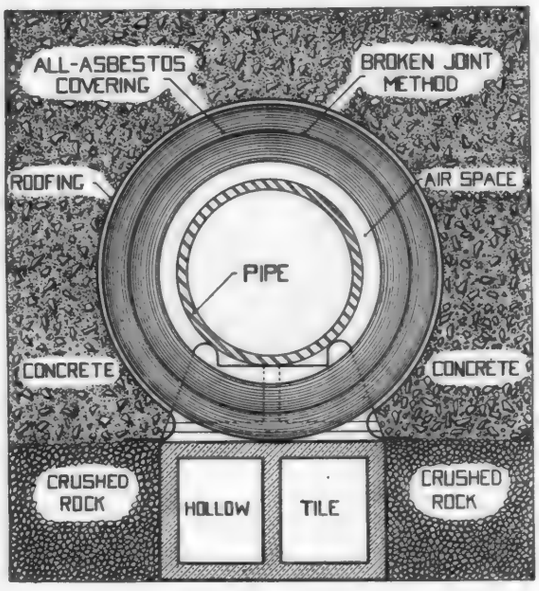
Where installations are made in accordance with our recommendations, we positively guarantee satisfactory hot water service.

Patterson-Kelley Co.,

Water Heating Engineers

107 E. 40th St. New York

UNDERGROUND—*Pipe Covering*—UNDERGROUND



Sold in carload lots, or smaller.
Write for further information, and prices.

The UNDERGROUND Conduit and Covering shown in cut is the result of twenty-five years practical experience in the design and construction of underground Steam and Hot Water Mains.

The UNDERGROUND Covering is furnished in All-Asbestos or 85% Magnesia and of the single or double thickness type. These Coverings are made so strong that the monolithic Conduit is poured without supports around the covering, and it is furthermore provided with a heavy asphalt jacket so that the installation is thoroughly damp proof.

Easily installed—your own men can do it. Complete specifications for application furnished with all orders.

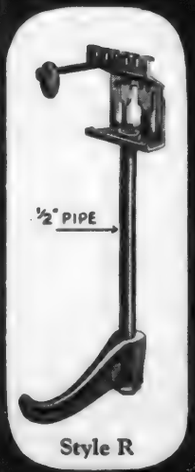
(3150)

Central Heat Appliances, *J. C. HORNUNG Engineer* 343 So. Dearborn St., Chicago

RADIATOR HANGER
YOU'LL USE 'EM YET!

Only one bolt per hanger. It requires no accurate placing since hangers have both lateral and vertical adjustments. Write for ALL the advantages.

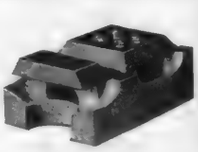
HEALY-RUFF CO.
772 Hampden Ave.,
St. Paul - - Minn.



—AT LAST—
Home Study Courses
in
Heating and Ventilating Engineering
(By Mail)
Our Course HB
is devoted entirely to
Gravity Steam and Water Heating
Our Literature on Request
A-EM-DEE ENGINEERING COMPANY
Consulting Engineers
3166 18th St., N.W. . Washington, D. C.

Burn Anything from Egg to Screenings with Pyramid Grates

The wide range in fuel which **Pyramid Grates** burn makes them highly economical.
Write for testimonial letters showing 65% saving in fuel bills.



Let Us Send Full Details

PYRAMID IRON PRODUCTS CO.
138 Liberty Street . New York City

Write for a list of Ric-wiL users located in your vicinity.

This Ric-wiL job, running between two buildings along a hillside, had no lower trench wall to obstruct the camera. It shows Ric-wiL construction clearly. Base Drain, pipe supports and support sections in place, ready to install pipes.

What Price Efficiency!

THE problem is not to make an underground conduit efficient. Any good engineer, allowed plenty of money, can devise a system that will show a high efficiency.

But what price efficiency?

The problem is to obtain as high an efficiency as is justified by the expense of producing the heat to be transmitted—and to obtain it at a cost low enough to make the investment profitable.

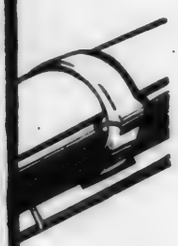
Ric-wiL has proved in miles of installations that it does this. It assures a practical profitable efficiency.

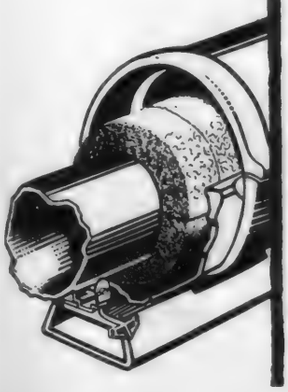
Our Engineering Department will be glad to show you exactly what this means on the next job you have. Write us about it.

THE RIC-WIL COMPANY CLEVELAND, OHIO

RIC-WIL Economies No. 4

Ric-wiL Base Drain forms a firm cradle on which the tile conduit is easily and quickly laid. No bed of broken stone to form and grade, which means a large saving in labor time and in material. This is another of the many cash economies of Ric-wiL, the result of the same careful engineering which has made Ric-wiL Underground Conduit high in efficiency and long of life.





RIC-WIL

UNDERGROUND CONDUIT

"Keeping Others In Hot Water"—

for
Hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools and laundries

Special Attention Given to Installations Requiring Large Quantities of Hot Water, with Live or Exhaust Steam as the Heating Medium.

—may be a pastime for some folks, but for the Sims Company it is a serious proposition—a matter requiring a thorough knowledge of hot water requirements.

A long study of these requirements enables us to offer heaters that assure constant and efficient hot water service.

Engineers feel safe in specifying "SIMS" because they know it means **reliability**—a service you want to render your client.

SIMS CLEAN E-Z STEAM TUBE STORAGE HEATER

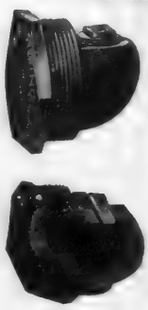
Our Engineers will gladly confer with you, without obligation, on your hot water problems.

THE SIMS CO.

Erie, Pa.

A good place to live, to work and to play.

Wonderful Savings in the Cost of Heating are made with Metering Radiator Bushings



Patent Allowed

Let us tell you about the savings the users of this simple device are obtaining.

Used to decided advantage on any return line or vacuum installation. Equally good for correcting installed plants as for plants being installed. A wonderful device for reconstructing extravagant plants at a price that will get the job.

Write for circulars

They are placed in supply end and proportion the steam to each radiator as required.

THE HOLLEY ENGINEERING COMPANY
VIRGINIA, MINN.

HEATING **POWER**

Stanwood Smokeless Boilers

HEATING CAPACITY
Steam—3300 Sq. Ft. to 25,000 Sq. Ft.
Water—5200 Sq. Ft. to 40,000 Sq. Ft.

NO MUD LEGS OR STAYBOLTS
LOW STACK TEMPERATURES
LOW WATER LEVEL—RAPID CIRCULATION

The Stanwood Corporation

CINCINNATI, OHIO
Successor to
THE HOUSTON STANWOOD & GAMBLE CO.

KIELEY
REGISTERED TRADE MARK

Steam, Water and Air Specialties

'98 REDUCING VALVE
125 Lbs. to 1 oz.

Manufacturers of the Complete Line

Send for Catalog 1923

KIELEY & MUELLER, Inc.
Main Office and Works
34-38 West Thirteenth Street
New York, N. Y.

RETURN TRAP
High or Low Pressure

How a Central Heating Plant is Caring for Expansion in its Distribution Lines

—by using BADGER Self-equalizing Expansion Joints

The New York Steam Corporation, with more than 20 miles of steam main, is caring for its expansion requirements, one of its most vital problems, by the use of **Badger Self-Equalizing Expansion Joints.**

These **Badger Joints** are used throughout this job because they are capable of meeting all demands of expansion in a high pressure steam line. These include the provision against the most costly loss in furnishing steam—namely, **leaks.** A **Badger Joint** means a tight, permanent job.

Easy installation and minimum space requirements are also important features. Let us send full information regarding Badger advantages.

E. B. BADGER & SONS COMPANY

75 PITTS STREET, BOSTON, U. S. A.

Branch Offices in Principal Cities.

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS.

Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corporation, Philadelphia, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Fleisher Co., Inc., W. L. New York.
Grinnell Company, Providence, R. I.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

AIR COOLING AND DRYING SYSTEMS.

Aerofin Corp., Newark, N. J.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Fleisher Co., Inc., W. L., New York
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spray Engineering Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

AIR ELIMINATORS.

Jas. P. Marsh & Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Midwest Air Filters, Inc., New York.

AIR FILTERS.

Midwest Air Filters, Inc., New York.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.

AIR SEPARATORS.

Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., Inc., New York.
Fleisher Co., Inc., W. L. New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

BLOWERS

Fan.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Pressure.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.

Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Turbine.

Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

BOILER CEMENT.

Johns-Manville, Inc., New York.

BOILERS.

Down-Draft.

American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
General Boilers Co., Waukegan, Ill.
Hart and Crouse, Utica, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Universal Smokeless Boiler Co., Ravenna, O.

Heating.

American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Continental Heater Corp., Dunkirk, N. Y.
Cox Stove Co., Abram, Philadelphia, Pa.
General Boilers Co., Waukegan, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Gurney Heater Mfg. Co., Boston, Mass.
Handon Boiler Corp., New York.
Heggie Simplex Boiler Co., Boston, Mass.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Niagara Radiator & Boiler Co., North Tonawanda, N. Y.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York
Pierce, Butler & Pierce Mfg. Co., New York.
Ross Boiler Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Furnace Co., Newark, N. J.
Titusville Iron Works, Titusville, Pa.
Universal Smokeless Boiler Co., Ravenna, O.
Utica Heater Co., Utica, N. Y.
Wayne Heater Corp., Richmond, Ind.
Weil-McLain Co., Chicago, Ill.

Power.

Heggie Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Ross Boiler Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Sarco Co., New York.

COILS, PIPE.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.

Air.

New York Blower Co., Chicago, Ill.

CONDENSERS.

Alberger Heater Co., Buffalo, N. Y.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER.

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.
Wyckoff & Son Co., A., Elmira, N. Y.

COOLERS.

Oil.

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS.

Badger & Sons Co., E. B., Boston, Mass.
Spray Engineering Co., Boston, Mass.

COPPER BOILERS.

Dahlquist Mfg. Co., Boston, Mass.

COPPER KETTLES.

Dahlquist Mfg. Co., Boston, Mass.

COVERING PIPE.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A, Elmira, N. Y.

DAMPERS, DUCT.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.

DEHUMIDIFYING APPARATUS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corp., Newark, N. J.
Fleisher Co., Inc., W. L., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

DISTILLERS, (Water).

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.

DRAFT APPLIANCES.

Crown Fuel Saver Co., Richmond, Ind.
Wolff Coal Saver Co., Chicago, Ill.

DRYING SYSTEMS.

(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.

DUST COLLECTORS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F. Hyde Park, Mass.

DUST DETERMINATORS.

Atmospheric Conditioning Corp., Phila., Pa.

ENGINES.

Steam, Automatic.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.

American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

EQUALIZING LOOPS.

Hoffman Specialty Co., New York.

EVAPORATORS.

Boiler Feed Make-Up.

Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

EXHAUST HEADS.

Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wright-Austin Co., Detroit, Mich.

YOUNG

CENTRIFUGAL VACUUM AND BOILER FEED

PUMPS

insure return of condensation to boiler, as they are built for a discharge pressure to boiler of 18 to 20 pounds

THESE pumps have an ample air and water capacity. They are sold under a guarantee to produce 10 inches of vacuum on the heating system, with a temperature of condensation not to exceed 180 degrees, in a properly laid out and equipped system, and to handle with entire adequacy the air and water called for by their rated capacity.

These are but two of the many important values of Young Pumps.

For Bulletins address

The Young Pump Company

230 East Ohio Street

CHICAGO

CENTRIFUGAL VACUUM PRESSURE PUMPS

YOUNG PUMP COMPANY

ENGINEERS' SPECIFICATION INDEX (Continued)

EXHAUST SYSTEMS.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York.

EXPANSION JOINTS.
American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Dahlquist Mfg. Co., Boston, Mass.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Howard Iron Works, Buffalo, N. Y.
Illinois Engineering Co., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.
Wheeler Condenser & Engineering Co., Carteret, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, EXHAUST.
Amercan Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

FEEDERS
Boiler
Kieley & Mueller, Inc., New York.
McDonnell & Miller, Chicago, Ill.
Taylor Machine Works, Battle Creek, Mich.

FILTERS, (Aerating).
Griscom-Russell Co., New York.

Feed-Water.
Elliot Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS, FLANGED.
American District Steam Co., No. Tonawanda, N. Y.
Clow and Sons, Jas. B., Chicago, Ill.
Grinnell Company, Providence, R. I.

FLANGES.
American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Detroit, Mich.

GASKETS, METALLIC.
Sarco Co., New York.

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American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

GAUGES.
Altitude.
Pierce, Butler & Pierce Corp., New York.

Draft.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Hydraulic.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Ounce Graduated.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.

Pressure.
American Dist. Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.
Bishop & Babcock Co., Cleveland, Ohio.

Vacuum.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

Vacuum (Compound).
Cashin Co., W. D., Boston, Mass.
Pierce, Butler & Pierce Corp., New York.

Water.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenburg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bristol Co., Waterbury, Conn.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.

GOVERNORS, (Pump).
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Westinghouse Elec. &. Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

GRATES
Dumping
Pyramid Iron Products Co., New York.

Rocking
Pyramid Iron Products Co., New York.

Shaking
Pyramid Iron Products Co., New York.

Shaking and Dumping
Pyramid Iron Products Co., New York.

Shaking, Circular
Pyramid Iron Products Co., New York.

Stationary
Pyramid Iron Products Co., New York.

HEATERS.
Domestic Water.
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Dahlquist Mfg. Co., Boston, Mass.
Everhot Heater Co., Detroit, Mich.
Excelso Specialty Works, Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Electrical Unit
Ilg Electric Ventilating Co., Chicago, Ill.

Feed Water, (Closed).
Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Open).
Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.
Alberger Heater Co., Buffalo, N. Y.
American Blower Co., Detroit, Mich.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

Air, Fan System.
Aerofin Corporation, Newark, N. J.
American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

Portable Unit Air.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Pecco Incorporated, St. Louis, Mo.
Skinner Bros. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Supreme Heater & Ventilating Corp., St. Louis, Mo.
L. J. Wing Mfg. Co., New York.
(See also Ventilators, Portable Unit.)

HEATING SYSTEMS.
"Gasteam".
James B. Clow & Sons, Chicago, Ill.

Vacuum.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Vapor.
American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gold Car Heating & Lighting Co., Brooklyn N. Y.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Haines & Co., Wm. S., Philadelphia, Pa.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane & Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Warm Air
MaGirl Foundry & Furnace Wks., Bloomington, Ill.

Water.
Grinnell Company, Providence, R. I.
Thrush & Co., H. A., Peru, Ind.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Grinnell Company, Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

HUMIDITY CONTROL.
American Blower Co., Detroit, Mich.
Atlas Valve Co., Newark, N. J.
Atmospheric Conditioning Corp., Phila, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The Foxboro, Mass.
Grinnell Company, Providence, R. I.
Klipfel Mfg. Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

INSTRUMENTS
Electric Measuring.
Bristol Co., Waterbury, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

Indicating and Recording.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bailey Meter Co., Cleveland, O.
Foxboro Co., Inc., The Foxboro, Mass.

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ENGINEERS' SPECIFICATION INDEX (Continued)

Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York
Westinghouse Elec. & Mfg. Co., East Pittsburg, Pa

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Union Fibre Co., Winona, Minn.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.

Feed Water.

Central Station Steam Co., Detroit, Mich.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Flow

American District Steam Co., North Tonawanda, N. Y.
Spray Engineering Co., Boston, Mass.

Pitot Tube.

American Blower Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Foxboro Co., Inc., The Foxboro, Mass.

MOTORS (Electric).

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

NOZZLES, SPRAY

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Co., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Manufacturing Co., Milwaukee, Wis.
Carrier Air Conditioning Co. of America, Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

OIL BURNING EQUIPMENT

Johnson Co., S. T., Oakland, Cal.

OZONE APPARATUS.

United States Ozone Co., Scottdale, Pa.

PIPE.

Cast Iron.

Clow & Sons, Jas. B., Chicago, Ill.

Steel.

National Tube Co., Pittsburgh, Pa.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Grinnell Company, Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (Wood).

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.

PIPE, POWER.

Grinnell Company, Providence, R. I.

PUMPS.

Centrifugal.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Taylor Machine Works, Battle Creek, Mich.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Nash Engineering Co., So. Norwalk, Conn.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yoemans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Elliott Co., Jeannette, Pa.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

RADIATOR BUSHINGS.

Metering.

Holley Engineering Co, Virginia, Minn.

RADIATOR HANGERS.

Gloeckle, Jr., A. F., Rochester, N. Y.
Grinnell Company, Providence, R. I.
Healy-Ruff Co., Minneapolis, Minn.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS.

"Gasteam."

James B. Clow & Sons, Chicago, Ill.

"Gaswater."

Clow & Sons, Jas. B., Chicago, Ill.

RADIATORS, STEAM AND WATER.

Aerofin Corp., Newark, N. J.
American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
Lyon Products Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, Ohio.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Wright-Austin Co., Detroit, Mich.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
Nelson Co., H. W., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.

Pressure.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Carrier Engineering Corporation, Newark, N. J.
Elliott Co., Jeannette, Pa.
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

SEPARATORS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Wright-Austin Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SPRAY COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Massachusetts Blower Co., Watertown, Mass.

SPRAY NOZZLES

(See Nozzles, Spray)

SPRINKLER HEADS

C. S. B. Sprinkler Co., Boston, Mass.

STRAINERS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.

Pipe

Spray Engineering Co., Boston, Mass.

Steam.

American Dist. Steam Co., No. Tonawanda, N. Y.
Dunham Co., C. A., Chicago, Ill.
Eliott Co., Jeannette, Pa.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regular Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co, Milwaukee, Wis.
Wright-Austin Co., Detroit, Mich.

Water.

American Dist. Steam Co., No. Tonawanda, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regular Co., Boston, Mass.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Sarco Co., New York.
Spray Engineering Co., Boston, Mass.

THERMOMETERS.

(Recording and Indicating).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The Foxboro, Mass.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

Water.

Marsh & Co., Jas. P., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Fulton Co., Knoxville, Tenn.
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Powers Regulator Co., Chicago, Ill.

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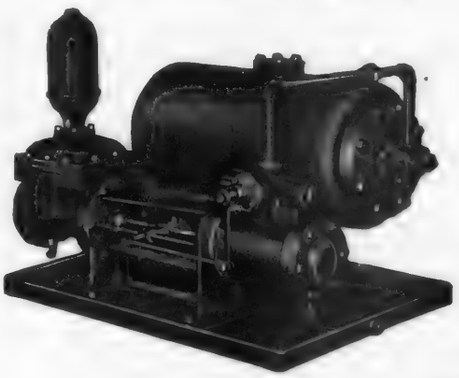
For Heating Systems—Steam and Motor Driven



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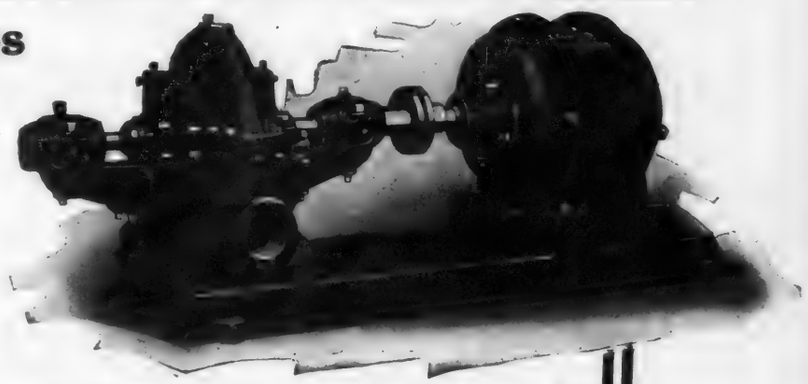

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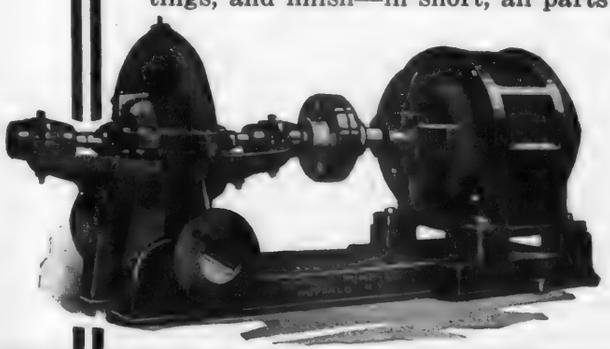
This popularity is due to their efficient design, which enables them to "stay on the job"; and an additional advantage of a low price—which is, of course, the result of quantity production.

Horizontally divided casing, double suction hydraulically balanced impeller, brass clearance rings, large, properly lubricated bearings, stuffing boxes large enough to hold plenty of packing, water seals, sub-base, coupling, fittings, and finish—in short, all parts of Class "S" Pumps—are of such design and finish as to insure the best results possible.



And the price is low.

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Buffalo Steam Pump Co.

480 BROADWAY BUFFALO, N. Y.

ENGINEERS' SPECIFICATION INDEX (Continued)

Sarco Co., New York.
Thrush & Co., H. A., Peru, Ind.

TRAPS.

Radiator.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D. Boston, Mass.
Dunham, C. A., Co., Chicago, Ill.
Hoffman Specialty Co., New York.
Ideal Heating Equipment Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Return.

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago Ill.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

Steam.

American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Elliott Co., Jeannette, Pa.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sarco Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.

Vacuum.

American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, P. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son, A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

VALVES.

Air (Automatic).

American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Fulton Co., Knoxville, Tenn.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

Air Relief.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Back Pressure.

Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Balanced.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Blow-off.

Elliott Co., Jeannette, Pa.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.

Check.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Float.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller Co., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.

Gate.

American District Steam Co., No. Tonawanda, N. Y.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Globe, Angle and Cross.

Commonwealth Brass Corp., Detroit, Mich.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Corp., New York.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.

Hydraulic-Operating.

Atlas Valve Co., Newark, N. J.
Klippel Mfg. Co., Chicago, Ill.

Non-Return.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

Radiator.

American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Commonwealth Brass Corporation, Detroit, Mich.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn, N. Y.
Gorton & Lidgerwood Co., New York.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Trane Co., La Crosse, Wis.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Reducing.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.

Regulating.

American District Steam Co., No. Tonawanda, N. Y.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

Relief (Water).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, Ohio.

Safety.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., Cincinnati, O.

Stop and Check.
(See Valves, Non Return).

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American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, Ohio.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
Peerless Unit Ventilating Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park. Mass.
(See also Heaters, Portable Unit Air).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila, Pa.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
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Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilating Co., New York.
Skinner Bros. Mfg. Co., St. Louis Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg Co., New York.

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Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Mushroom.

Knowles Mushroom Ventilator Co., New York.
Lyon Products Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

WEATHER STRIPS.

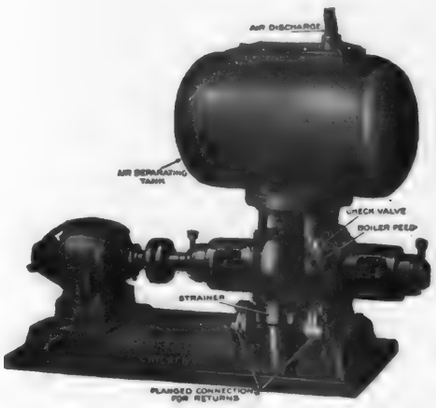
Metal.

Athey Company, Chicago, Ill.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Higgin Manufacturing Co., Newport, Ky.
Monarch Metal Products Co., St. Louis, Mo.

WELDING MATERIALS.

Linde Air Products Co., New York.
Oxweld Acetylene Co., Long Island City, N. Y.
Prest-O-Lite Co., Inc., New York.

SKIDMORE HYDRO TURBINE VACUUM AND BOILER FEED PUMP



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Operates on a different principle.

Simple, Efficient and Sure.

Manufactured of highest grade material along lines of best engineering practice.

All parts are accurately machined.

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The air rotor and centrifugal pump are bronze castings.

The Skidmore occupies half the floor space required for other makes of pumps.

A self-contained unit requiring no piping

Engineers requiring the best and wanting a pump, the high efficiency of which remains constant, should specify the Skidmore.

Bulletin No. 2 will be sent on request.

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General Offices and Factory

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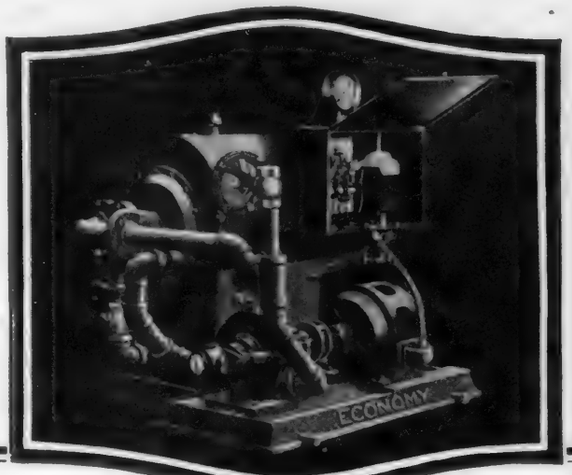

Type C. V. Fig. 2234—Single Model Vacuum Pumps

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This is an essential requirement of all apparatus entering into the equipment of every worth while project.

Economy Centrifugal Vacuum Pumps

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They use no more power than other pumps that do the same work.

They are guaranteed for performance and quality.

Representatives in Every Large City

Economy Pumping Machinery Co.

71-122 North Curtis St. CHICAGO

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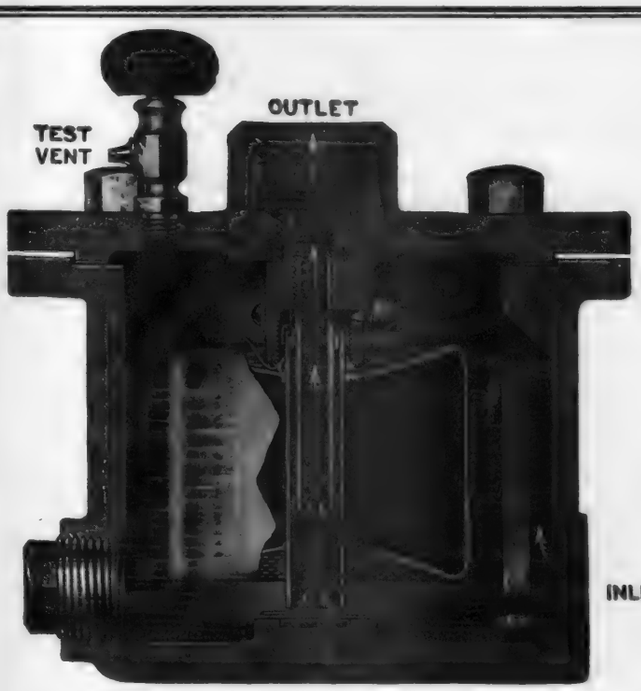

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for direct or indirect coils or any location where large quantities of water are to be discharged

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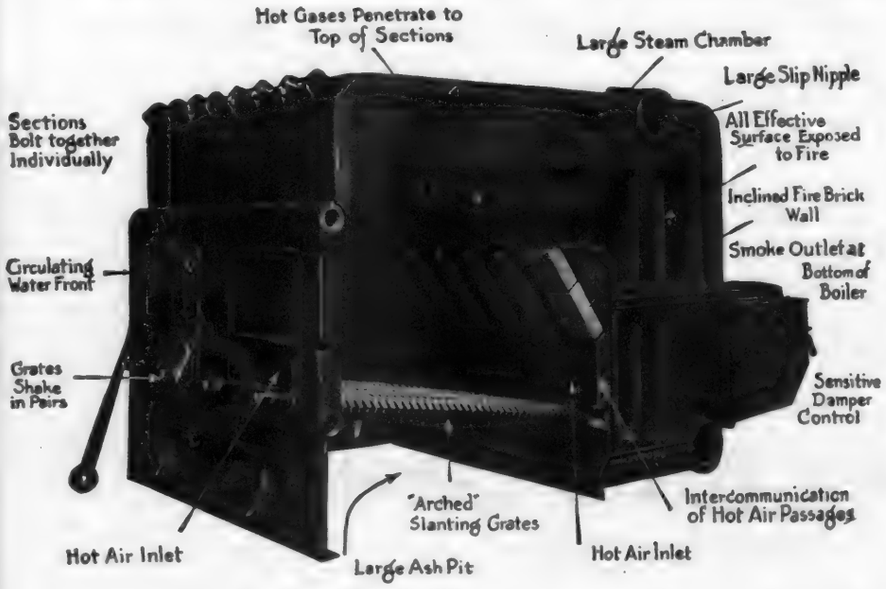
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Intercommunication of Hot Air Passages
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Hot Air Inlet
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Grates Shake in Pairs

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WOLFF DRAFT CONDITIONERS

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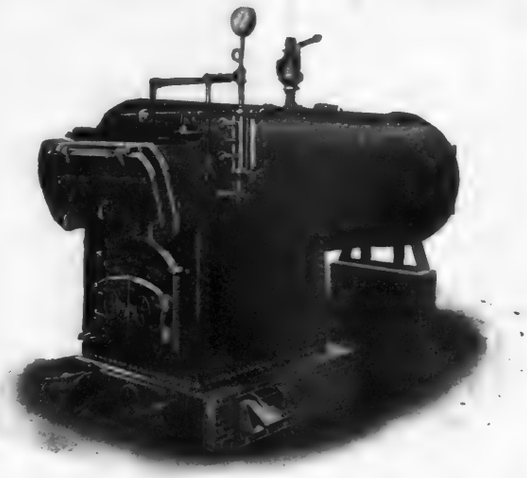

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41 E. 42nd St., New York City

—any price for Comfort!

THRUSH dealers are not caught in the maelstrom of price competition and cut-throat methods. No sir! They don't need to be. They're merchants dealing in one thing beyond price—HOME COMFORT! And who will haggle over price when it's *his* personal comfort, or the welfare of his loved ones which is at stake? Not many!

But of course Thrush Hot Water Heating System is inexpensive after all. Because of reduced pipe sizes possible with this *closed* system it is possible to sell an Automatically Regulated plant for the *same price* as the ordinary unregulated job would cost.

And it's Economical! Tests prove it saves coal and transmits heat faster than any other Hot Water System yet devised.

WRITE FOR CATALOG TODAY

H. A. Thrush & Co.
PERU, IND.

INTERNATIONAL

ECONOMY BOILERS

Easy access to flues for cleaning.

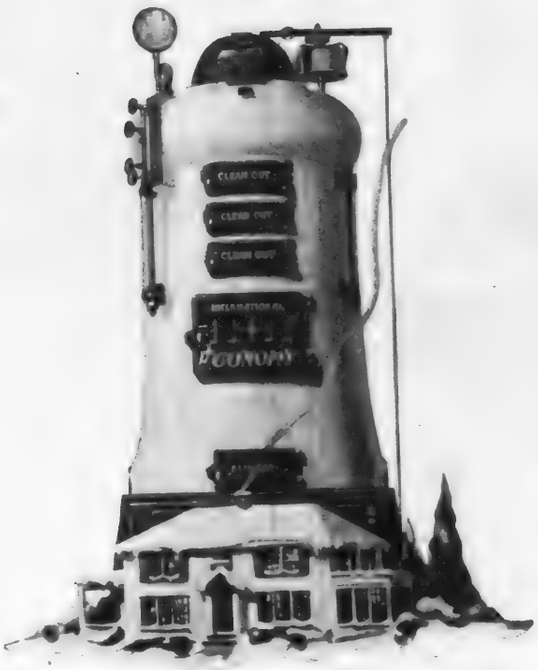
Positive cross fire travel.

Delivers dry steam.

Suitable grates for hard or soft coal.

Large coal capacity.

Conservative ratings.



(Round Sectional Type)

A good boiler is the foundation of a successful heating plant.

It's easy to check up the coal capacity, the grate area or the rating of any one boiler with another of a different make, but to check simply one feature doesn't get anywhere or prove that a boiler will be satisfactory.

The boiler that is carefully balanced in design, that operates efficiently under all kinds of conditions, that is reasonably rated and reasonably priced as a unit is what interests the dealer and steamfitter.

When you buy and install an INTERNATIONAL Economy Boiler you will have every reason to be confident that your interest in Economy Boilers has been worth while.

INTERNATIONAL HEATER COMPANY

UTICA, N. Y.

NEW YORK *CHICAGO* *CLEVELAND* *DETROIT* *NASHUA, N. H.*

Mose, How Do You Manage To Get Half Through The Winter On That Small Amount Of Coal?
Come On Over In February And I Will Let You In On De Secret
NOVEMBER.
That Same Pile Of Coal
Dat Is De Secret Of E-Conomy In Fuel—We Use De Universal Smokeless Boiler-Of Ravenna Ohio
FEBRUARY

We have not Increased our Ratings which are

GUARANTEED

Boilers rated at 5000 ft. steam and under are guaranteed to handle **50%** of their rated capacity.

Boilers rated at over 5000 ft. steam are guaranteed to handle **60%** of their rated capacity.

UNIVERSAL SMOKELESS BOILER CO.

Ravenna, Ohio

New Bethlehem Hotel, Bethlehem, Pa, Ritter & Shay, Philadelphia, Architects. Hersh Bros., Allentown, Plumbing Contractors.

THE good folks in Bethlehem, Pa., are proud of the Hotel Bethlehem, and justly so. For not only is it a handsome structure, but nothing is wanting in providing every comfort for its guests.

In selecting radiator traps on which they could rely to give the utmost efficiency and durability, the architects chose

SARCO

Radiator Traps

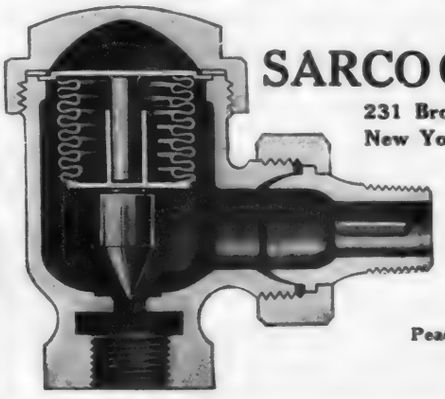
Here are some of the features which sold the Sarco.

It has unusually long life because the metal in the helical bellows is stressed less than in disc constructions. Corrugations of the helical bellows being spiral, a perfectly even distribution of movement is insured.

The case is of heavier brass than ordinarily used. The expansion element is suspended from the case and is freely interchangeable even by unskilled labor.

Its discharge opening is larger and its lift is higher than in most traps.

Write for booklet P-123

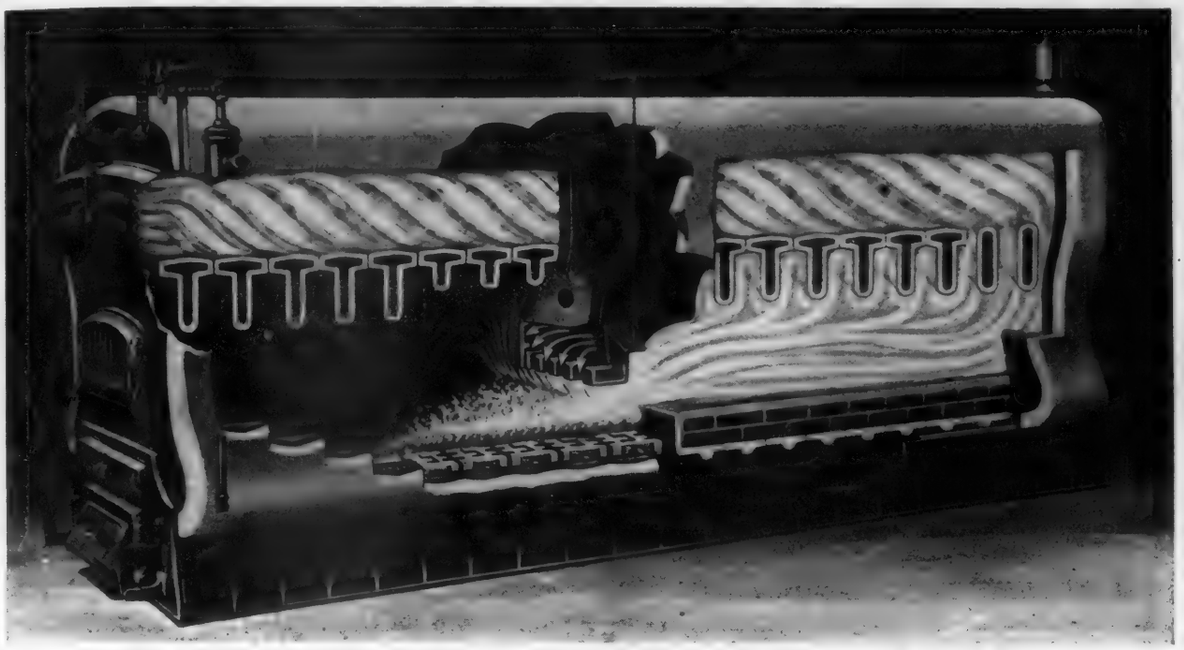


SARCO CO., Inc.

231 Broadway
New York City

Buffalo, Chicago, Cleveland, Boston, Detroit, Philadelphia.

Peacock Bros., Ltd., Montreal



Cutaway View of Utica-Imperial SUPER-SMOKELESS Boiler

UTICA-IMPERIAL

SUPER-SMOKELESS BOILERS

Extremely Efficient for Oil Burning!

A recent improvement put the Air Regulation under easy control from the front of the boilers.

Exterior View of Boiler

SUPER-SMOKELESS Boilers have achieved the same remarkable success in burning oil as they have attained in burning soft coal. The scientific design of these boilers, developed after years of careful study, testing and experiment, fits them ideally for oil-burning. The increase in furnace volume in the direction of the fire travel—a feature peculiar to the SUPER-SMOKELESS—insures the free expansion and thorough mixture of the oil with the air and consequent complete combustion of the gases before they come in contact with the heating surfaces. The Baffle Section serves to retard the rapidity of the gas travel, while the large Combustion Chamber provides ample space for the complete mixture of oil and air and the length of travel necessary to insure complete combustion of the gases at a high temperature.

Engineers and Contractors are invited to write for our Oil Heating Bulletin.

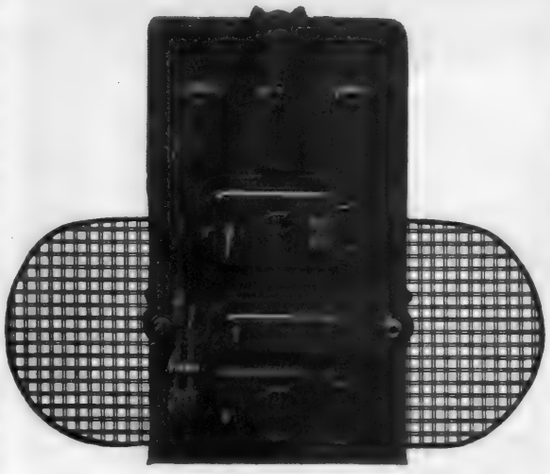
Manufactured by the

UTICA HEATER COMPANY

UTICA, New York

CHICAGO CLEVELAND NEW YORK

Sales Offices in the Principal Jobbing Centers



Equipped with Automatic Hot Water Damper Regulator; Hot Water Relief Valve Set at 80 Lbs., Two Brass Clean-out Plugs in Front, etc.

NEW

in the

Burnham Family

A HIGH pressure, cast iron boiler that will put push behind your business.

Apartment houses, hotels, laundries, etc., will welcome its advantages.

It is built for quick action. Weight is placed where extra strength is needed —not where it clogs up the heating action. Special stays at special points assure longer life. Working pressure of 80 lbs. guaranteed.

Satisfaction *plus* is now in your power to give by installing Burnham Water Tube Boilers.

But satisfy yourself first by writing for the special descriptive circular—Improved Water Tube Boiler.

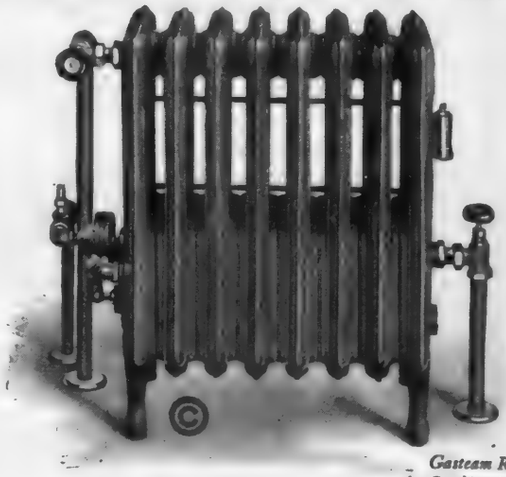
Burnham Boiler Corporation

IRVINGTON, N. Y.
30 EAST 42nd STREET

Representatives in all Principal Cities

Canadian Offices:
Harbor Comm. Bldg., Toronto
124 Stanley St., Montreal

The extra cost so little— the advantages so great



Gasteam Radiator in Combination System

Two heating systems in the same number of radiators

ISN'T it worth while to have a heating system that permits of:

Starting the boiler a month or two later in the fall? Shutting down the boiler a month or two earlier in the spring?

Such a system is easily obtainable. It is nothing new. It is simply the use of Clow Gasteam Radiators in rooms requiring heat in mild weather, such as dining rooms and living rooms of apartments, or in office buildings.

The Clow Gasteam Radiators are a part of the standard heating system. When the heating plant is going, they act as ordinary radiators. When the heating plant is shut down at nights, or in the spring and fall, the Gasteam Radiators supply quick, healthful heat, when and where it is wanted.

Clow Gasteam Radiators are supplied fitted for either vacuum or vapor, one or two pipe systems. Also Clow Gaswater Radiators for Hot Water Systems.

JAMES B. CLOW & SONS
534-546 S. Franklin St., Chicago
Sales Offices in Principal Cities

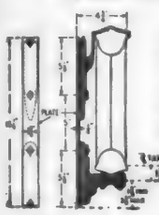
{Each Radiator an Independent Steam Heating Plant}

CLOW

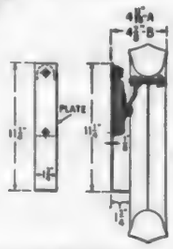
GASTEAM — GASWATER

Send for this authoritative new book—

ARCO Adjustable Wall Brackets

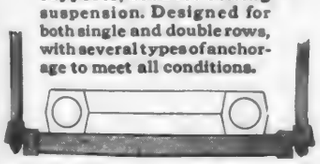


ARCO Bracket, No. 1 Single, for all "A" Peerless Sections; other sizes for "B" Sections and for double row sections are given in booklet.

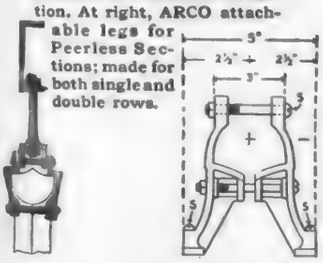


Another type of ARCO Bracket, for 5, 7 and 9 square foot sections in single row only.

ARCO Trapeze and Slip-End supports, used for ceiling suspension. Designed for both single and double rows, with several types of anchorage to meet all conditions.



At left, ARCO Pendant Flight attached to Peerless Wall Section. At right, ARCO attachable legs for Peerless Sections; made for both single and double rows.



EVERY ARCHITECT, Heating Engineer and Specification Writer will want this valuable new book for specification work. It contains the latest authoritative data on wall radiation, its many and varied uses and its specification for each particular requirement.

For years Peerless Wall Radiators have been the accepted standard for plant, factory and office heating; also for industrial work, humidifying, drying, cooling, and for countless uses where conservation of floor space is of first importance.

This new book pictures and describes these many uses. Of particular interest are the new forms of radiator brackets which allow Peerless Wall Radiators to be installed in a number of new ways, such as on the ceiling.

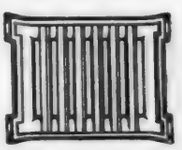
If you haven't this new book already in file, your name on your letterhead, sent to the address below, will bring it at once.

AMERICAN RADIATOR COMPANY

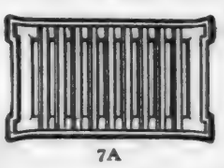
Dept. T-138 1807 Elmwood Avenue, Buffalo, N.Y.

Sales Offices in all principal cities

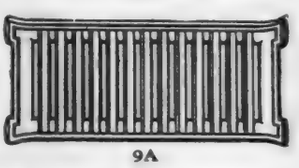
Peerless Wall Radiators are made in five sizes



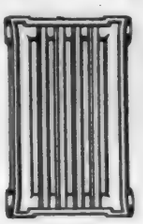
5A



7A



9A

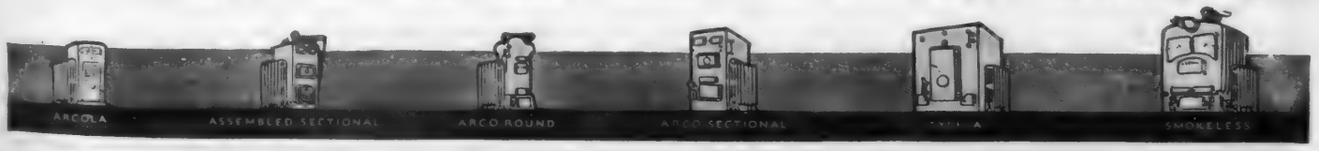


9B

7B

9 Foot Sections can be furnished with White Vitreous Enamel Finish.

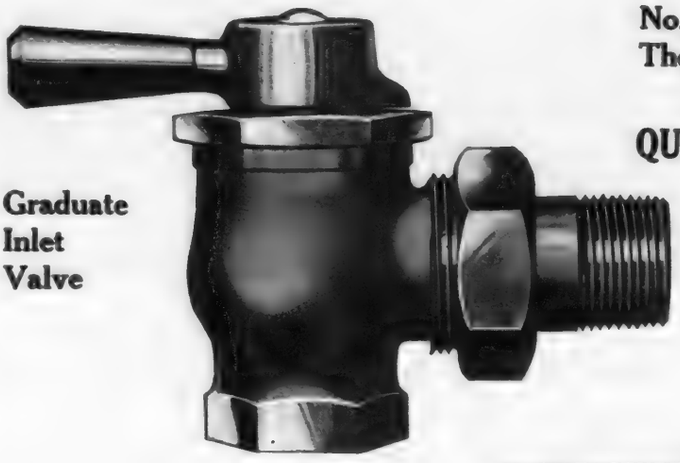
IDEAL BOILERS AND AMERICAN RADIATORS FOR EVERY HEATING NEED



THE
W.D. CASHIN CO.
THERMOFLEX

HEATING SPECIALTIES

No. 1
Thermoflex Trap



Graduate
Inlet
Valve

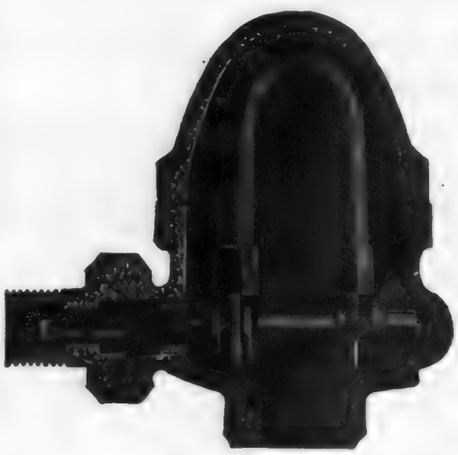
QUALITY—EFFICIENCY—APPEARANCE

The Price is right.

Send for complete catalog and quotations.

For all types of vapor and vacuum heating systems.

MANUFACTURED BY
W. D. CASHIN COMPANY
35 HARTFORD STREET, BOSTON, MASS.



"VENTO" Advantages

System starts with valve wide open, assuring circulation almost the instant steam is turned on.

Control of valve opening from two to eight times larger than other makes of valves.

Size of valve opening reduces danger of fouling with scale or other foreign matter.

Closes absolutely tight against steam. No necessity for use of spray water at pump.

Cannot stick or gum from foreign matter, and operation is absolutely noiseless.

The Perfect Automatic Valve for Vacuum or Vapor Heating

The "Vento" Automatic Valve represents a steady improvement in the Haines line of steam traps and offers the highest degree of steam trap efficiency.

There has been no change in the old reliable principle that has placed Haines Automatic Valve in a class by itself. The operating power is identical—the only difference being in the general construction.

Special features are: Horizontal mounting of valve mechanism—long range of movement—positive action—quick opening and closing.

Send for booklet

WILLIAM S. HAINES & CO.
12th & Buttonwood Streets
PHILADELPHIA, - - PA.

VENTO

PAGE BOILERS

"The Distinguished Service Line"

Monarch
Smokeless Boiler
(Cutaway View)

It is pretty well understood that if a heating plant is properly engineered and later turned over to the care of a competent fireman, even a boiler of poor design will probably give fairly good results.

But do you not owe it to your client to give him the best in boiler design, to fit the conditions of his building?

Page Boilers are making many thousands of good heating plants produce results, often exceeding expectations, with the minimum of attention and lowest fuel cost.

For All Fuels—
Hard Coal,
Soft Coal,
Gas or Oil.

Send for Catalogue 51. It gives you in concise form, complete specification data.

THE WM. H.
PAGE BOILER CO.

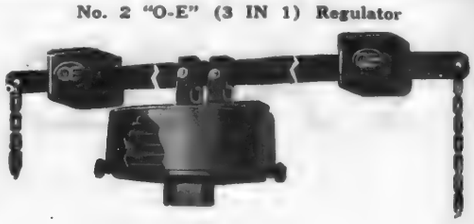
58 West 40th Street
NEW YORK

BOSTON CLEVELAND
PHILADELPHIA MEADVILLE

Established 1856 Incorporated 1877

THE O-E 3 IN 1 HEATING SPECIALTIES

No. 2 "O-E" (3 IN 1) Regulator



Three Systems in One

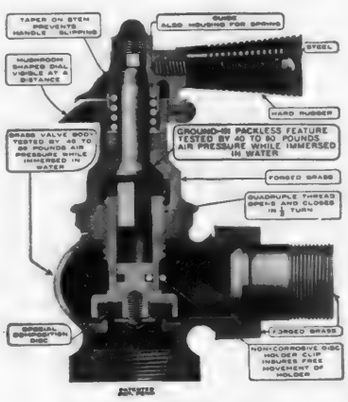
Vapor, part of the time.
Vacuum, most of the time.
Pressure, when wanted.

Insure Efficiency Heating

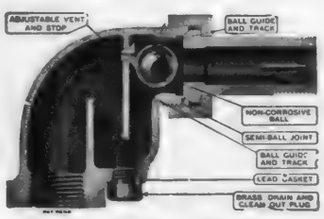
The O-E System of Heating is based on a thorough knowledge of heating requirements. Every part represents high grade manufacture and workmanship, and simplicity eliminates the possibility of trouble. Costs less to operate and gives more heat.

Our claim for high efficiency is not based entirely upon our own opinion of O-E performance. Severe tests by other experts have shown the O-E System superior to others, and testimony has been added to our claim by many whose buildings are O-E heated. Send for Catalog "A."

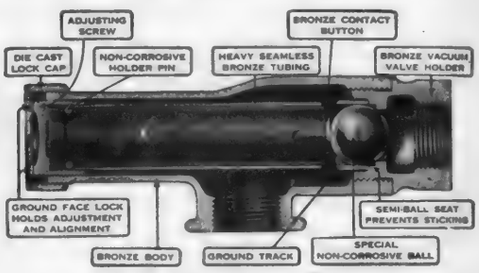
O-E Specialty Mfg. Co., 12 Keefe Ave., Milwaukee, U. S. A.


TAPER ON STEM PREVENTS HANDLE SLIPPING
GUIDE ALSO HOUSING FOR SPRING
STEEL
MUSHROOM SHAPED DIAL VISIBLE AT A DISTANCE
HARD RUBBER
GROUND-IN PACKLESS FEATURE TESTED BY 40 TO 80 POUNDS AIR PRESSURE WHILE IMMERSED IN WATER
BRASS VALVE BODY TESTED BY 40 TO 80 POUNDS AIR PRESSURE WHILE IMMERSED IN WATER
FORGED BRASS
QUADRUPLE THREAD OPENS AND CLOSES IN ¼ TURN
SPECIAL COMPOSITION DISC
FORGED BRASS
NON-CORROSIVE DISC HOLDER CLIP INSURES FREE MOVEMENT OF HOLDER

"O-E" Improved Perfect Packless Graduated Valve

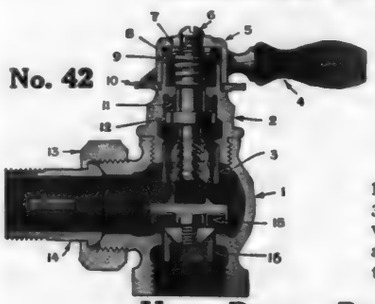


"O-E" Perfect Ball-Check Water Seal Union Elbow with Adjustable Air Vent.



"O-E" Improved Air Exhauster and Vacuum Valve

McALEAR SPECIALTIES FOR VAPOR HEATING SYSTEM



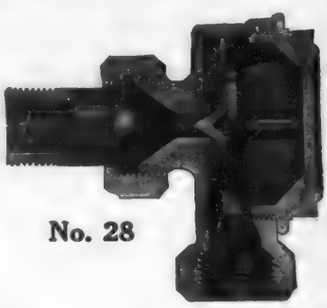
No. 42

Packless Radiator Valves

Quick-opening, nickel-plated brass body. Fig. 38, angle pattern, wood wheel handle; Fig. 42, angle pattern, graduating type, lever handle.

Radiator Traps

Discharge air and water in large quantities. Close tight against steam. Noiseless in operation. Nos. 28 and 28-A of steam metal, furnished N. P. unless otherwise specified. Nos. 28-A and 29-A have right and left-hand discharge openings. Nos. 29, 29-A, 33, 34 and 36 have iron bodies and brass caps, furnished plain unless otherwise specified.



No. 28

Vapor Damper Regulators

No. 58

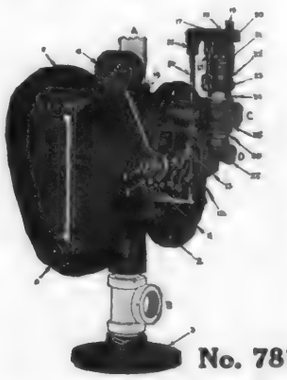
All metal, tapped for 1-inch steam pipe connection. Shipped complete with lever and two weights, S hooks, 2 ceiling pulleys and 12 feet of No. 10 plumbers' chain.

No. 56 for 0 to 3 pounds pressure, constructed with bellows of 10-inch flexible walls. No. 58 for 1 to 15 pounds pressure, constructed with bellows of 6-inch flexible walls.

Combination Float and Thermostatic Ball Check Valves

For venting supply and return mains of heating systems. These air valves close tight against water and steam, and by use of the check prevent the atmospheric pressure from entering the discharge opening.

No. 15



No. 781

Air Eliminator and Return Traps

For automatically returning the water of condensation direct to boiler and discharging air. Minimum distance between water line of boiler and bottom of trap should be 18 inches. "A"—inlet to trap; "B"—discharge to boiler; "C"—steam connection to boiler; "D"—air vent.

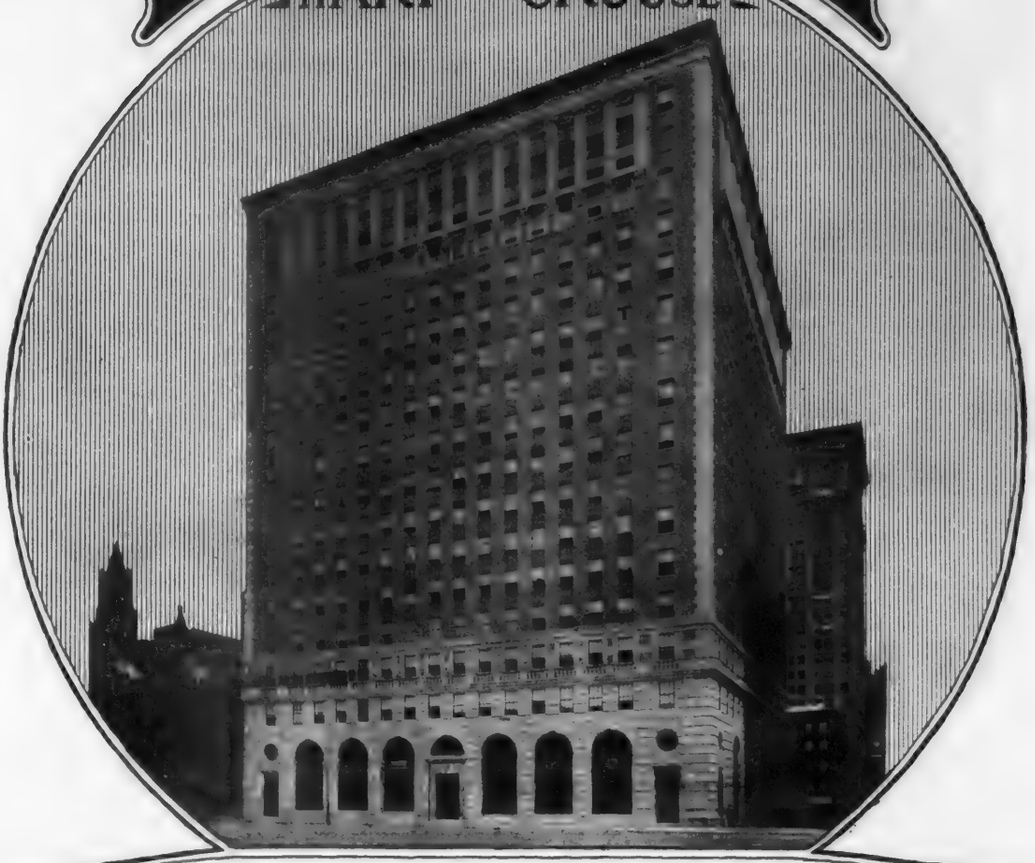
THE McALEAR MFG. CO.

1901-7 S. Western Ave.
CHICAGO, ILL.

ROYAL

ROUND SECTIONAL and SMOKELESS BOILERS

— HART AND CROUSE —



BARRETT BUILDING, NEW YORK

46,000 square feet direct radiation equivalent.

Architects, WARREN & WETMORE. Contractors, BAKER, SMITH & CO.

THE Barrett Building, one of New York's famous "sky line," bears the brunt of the most severe winter temperatures prevailing on the unprotected water front.

Only on rare occasions has it been necessary to operate more than two of the three S-558 ROYAL Hart & Crouse Down Draft Smokeless Boilers installed.

Soft coal is burned, *smokelessly, independent of firing skill.*

Cosy Cottage
or
Soaring Skyscraper

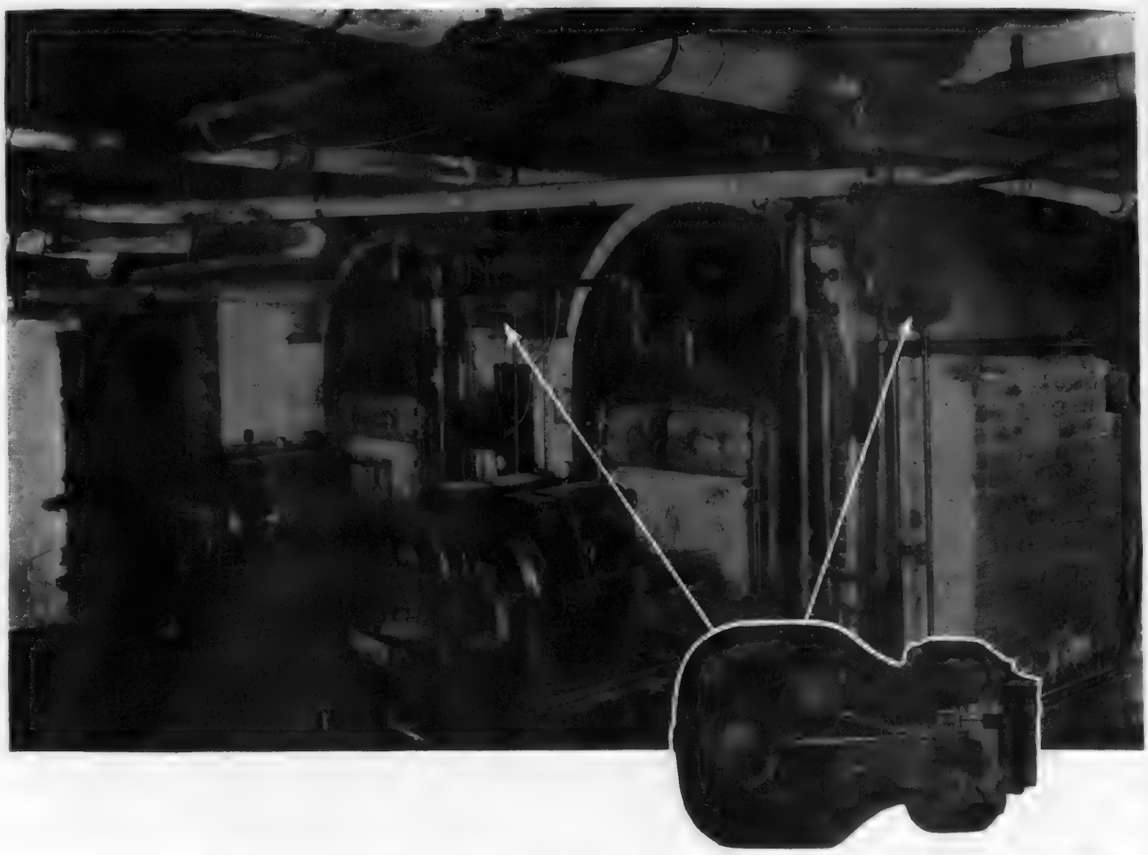
HART & CROUSE COMPANY

UTICA, N. Y.

BRANCH OFFICES

Boston	*Detroit	*Philadelphia
*Chicago	Grand Rapids	Pittsburgh
Cincinnati	Milwaukee	*St. Louis
Cleveland	*New York	*Utica

*Warehouse in connection



McDonnell & Miller Duplex Boiler Feeders installed in the Oak Park Masonic Temple, Oak Park, Ill.

IT NEVER FORGETS!

Forgetfulness of the water line on oil fired boilers is almost excusable, because it is so easy to forget the water line when you don't have to stoke the fire.

But the McDonnell & Miller Duplex Boiler Feeder never forgets. It is the watch-dog of your boiler water line—it never allows it to get too low or too high—it always maintains just the right level for greatest boiler economy. It prevents burned boilers and cracked sections—it eliminates "water line" worry, and completes the convenience argument of oil burners.

And on pump jobs the McDonnell & Miller Duplex Boiler Feeder is coming to be standard specification by the leading engineers, for they recognize it as a real protection against boiler damage in case the pump fails to function—due to failure of current or any unforseen reason.

It furnishes plenty of water in any emergency, and can be depended upon, under all conditions, without any thought on the part of the operator.

Write for our Bulletin No. H-6.

McDONNELL & MILLER

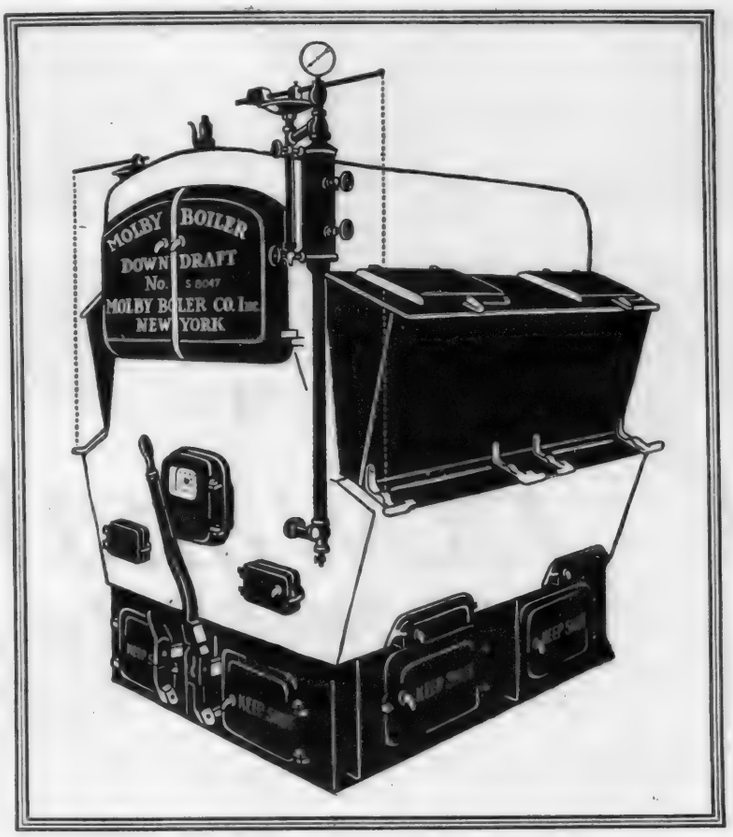
"Doing One Thing Well"

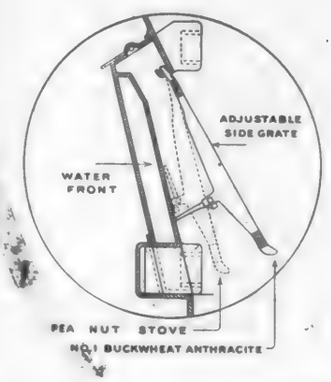
General Offices
WRIGLEY BLDG.
CHICAGO

M&M WATER FEEDER

Eastern Warehouse Stock
BUSH TERMINAL
NEW YORK

How much for coal ?





What Owners Say

(Names upon request)

from a New York Realty Company:

	with OLD HEATERS		*with* MOLBY BOILERS	
5	Tons Stove . . .	$70.00	5 Tons Buckwheat . .	$32.00
2½	Tons Stove . . .	35.00	2¼ Tons Buckwheat . .	14.40
2	Tons Stove . . .	28.00	1½ Tons Buckwheat . .	9.60
2	Tons Stove . . .	28.00	1½ Tons Buckwheat . .	9.60

from a Pennsylvania Home Owner:

"Have just placed my order for next season's coal at $7.50 a ton. I'm well satisfied with my Molby."

The New

MOLBY

HOUSE-HEATING BOILER

The Molby burns No. 1 Buckwheat Anthracite without mixing with the expensive larger sizes.

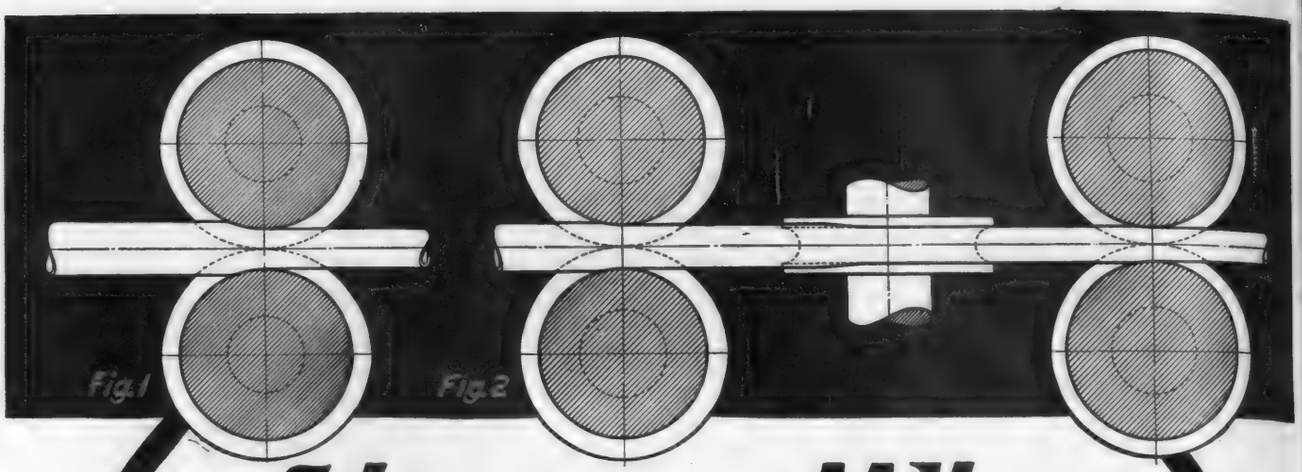
The magazine-feed saves hours of needless labor. You fill the hopper only every 12 or 14 hours. No electric current. No machinery to get out of order. No break-down hazard. No night attendance necessary.

burns No.1 Buckwheat

Downdraft—crossdraft. For low-pressure steam, vapor or hot water heating. Steam and vapor sizes from 500 to 7750 sq. ft. Hot water sizes from 850 to 12925 sq. ft.

Ask for catalogue.

MOLBY BOILER COMPANY, 41 East 42nd Street, New York



How and Why
"NATIONAL" Butt-weld PIPE is made free from scale

THE welding-scale, or mill-scale, which forms on skelp in the welding furnace, is removed from "NATIONAL" Butt-weld Pipe (sizes ½ to 3-inch) by a process that is entirely mechanical. While still hot from welding, the pipe is reduced slightly in diameter by passing through the rolls shown in Fig. 1, which loosen the scale somewhat. It is allowed to cool slightly, and then passed through another set of rolls shown in Fig. 2 (diagrams exaggerate reduction). These last rolls further reduce the diameter, and in doing so, the scale, which has become brittle while cooling, is fully loosened and falls from the pipe walls. The last pair of rolls give the pipe its proper diameter and true circular shape. After further cooling, the loose scale is blown out by compressed air or washed out with water.

By removing this scale, a clean, smooth surface is obtained for galvanizing or other coatings; friction losses caused by rough interior surfaces are reduced and increased working capacity of the pipe is obtained; clogging of pipe, valves, restricted orifices and delicate apparatus by loose scale is practically eliminated and any tendency to corrosion, especially in the form of pitting, is minimized. For details of this process and its advantages, write for a copy of "NATIONAL" Bulletin No. 7.

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.

Showing approximate amount of scale removed from a 20-foot length of 3-inch pipe.

Only

"NATIONAL" PIPE
IS MADE BY THE SCALE FREE PROCESS

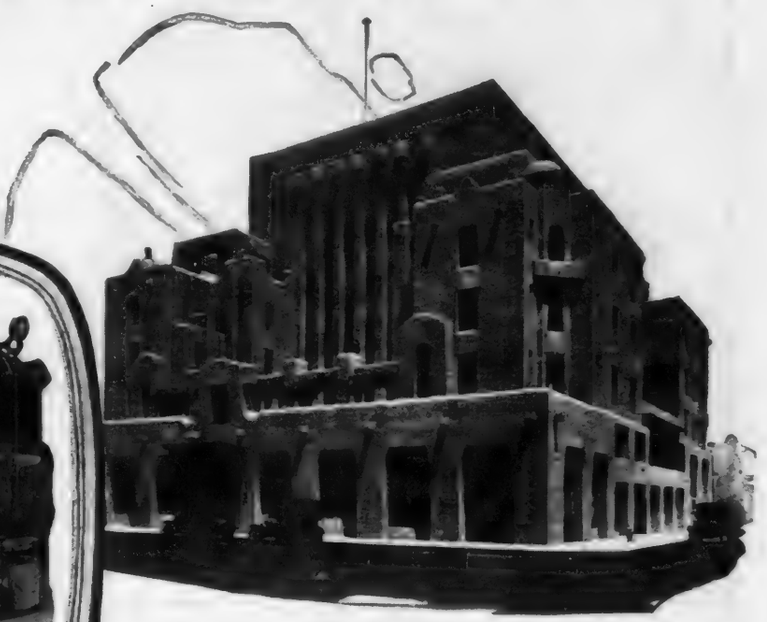
Continental

BOILERS & RADIATORS

Continental Low Water Line Boilers are made in regular and smokeless types and are well adapted for oil burning

30 Series Boilers, 43-inch Water Line
1200 to 8200 sq. ft. steam capacity

40 Series Boilers, 47-inch Water Line
2500 to 22,300 sq. ft. steam capacity



Hotel Albuquerque,
Albuquerque, N. M.
Architects—Trost & Trost, El Paso, Texas.
Contractors—E. M. Leach, Globe, Ariz.
Jobber—The M. J. O'Fallon Supply Co.,
Albuquerque, N. M.
Boiler No. 4033 S. Continental.

In New Mexico, Continental Low Water Line Boilers Save Space and Fuel

The builders of the impressive Hotel Albuquerque at Albuquerque, New Mexico, installed a Continental Low Water Line Boiler.

These six features of Continental design did the selling—

1. Its low water line eliminates refuse-gathering boiler pits.
2. It is a quick steamer.
3. Side feed makes it easier to fire.
4. It burns any kind of fuel.
5. It holds a steady water line.
6. Its perfect fire control makes it save fuel.

The performance of the Continental Low Water Line Boiler has kept the owners sold and has helped the M. J. O'Fallon Supply Company sell more.

Continental Heater Corporation

Dunkirk, N. Y., U.S.A.

The Story of Why Continental Boilers and Radiators are built for better heating is told in this book. You owe it to yourself to have a copy. Write for it now.

Built for better heating

One Man Tells Another About the Good

EXCELSO

The Excelso Heater is talked about wherever heating domestic hot water is concerned. Every owner of a steam or vapor heating system *is interested in how the Excelso practically eliminates the cost of gas or other fuel,* during the heating season.

Your specification of an Excelso Heater will be well received because of the popular regard for this quality product. The trade generally are familiar with it and understand thoroughly how to install it.

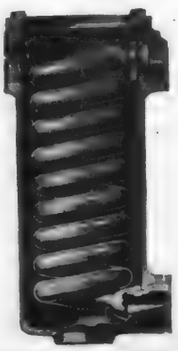
For further information and details of installations, write

EXCELSO SPECIALTY WORKS, INC.
117 Clinton Street, Buffalo, N. Y.

District Representatives:

210 E. 45th St., New York, N. Y. | **46 Cornhill, Boston, Mass.** | **5939 Haverford Ave. Philadelphia, Pa.**

Nationally Distributed by the Leading Jobbers and Boiler and Radiator Manufacturers.



Single coil heaters from 30 to 120 gal. capacity. Double coil Heaters from 160 to 400 gallon capacity.

Triple coil Heaters from 600 to 800 gal. capacity for large installations such as apartments, hotels, etc.

EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters

IDEAL Gas Boilers need "firing" but twice a year.

A snow shovel is the only kind he uses

TWO "FIRINGS" a year—Fall and Spring—sounds mighty attractive to householders accustomed to three firings a day—morning, noon, and night.

The workless luxury of IDEAL Gas Boilers has banished coal shovels, ash cans, and canvas gloves from many homes. That's why they are so easy to sell.

And IDEAL Gas Boiler profits are *yours to keep.* The local gas company is not only your jobber but your "Service Department" as well. Its competent service force systematically maintains equipment installed on its lines. What other form of non-solid fuel device offers this advantage that means so much to your profits and your good-will?

IDEAL Gas Boilers are tested and rated under AGA Code. Capacity required, therefore, is only 25% in excess of total condensing load (including piping). Efficiency attained is more than 85%.

Write us, or see your gas company, for details of the IDEAL Gas Boiler selling plan and comparative cost data.

THE A. H. WOLFF GAS RADIATOR COMPANY

Distributors American Radiator Company's IDEAL Gas Boilers

376 Lafayette Street Dept. G 44 New York City

In Cincinnati, O.

In Denver, Colo.

In Wilmette, Ill.

In St. Louis, Mo.

In Portland, Ore.

In Buffalo, N.Y.

Gas Heating is Nationally Recognized as the Ideal Method of House Heating

The promotion of gas heating by gas companies, by the 20 Bryant sales offices, and by Bryant's national advertising has developed a country-wide desire for the comfort and convenience of gas fuel.

After all, what greater convenience can be included in a home than a heating plant that requires "*not even a glance for weeks at a time*"?

The help of our sales and engineering organization is given gladly. For details, write—

THE BRYANT HEATER & MFG. COMPANY
954 East 72nd Street, Cleveland, Ohio
Branches in Principal Cities

BRYANT HEATING

for Hot Water — AUTOMATIC GAS — Steam *or* Vapor

New Piping for Old

Before Deactivation

After Deactivation

The photographs above are sections of pipe from the hot water lines at the Passyunk Operation of the Girard Estate, Philadelphia. The choked pipe was removed after twelve years of service just before a Deactivator was installed. The lower pipe section was removed three months later.

It is good news for the building owner to learn that the same process which removes from the water its power to corrode and rust away the piping, will also gradually dissolve away the accumulated rust products inside the piping. This treatment is thus the means of clearing out a clogged-up piping system. It accomplishes a good job of pipe cleaning. It removes the cause of red water. Better still, it makes further filling up with rust or corroding of the pipes impossible.

These benefits are accomplished by Elliott Deactivators and Deaerators. They remove from the water the free and dissolved oxygen, the direct or indirect cause of all corrosion in piping.

Heating and ventilating engineers should be entirely familiar with this comparatively new process.

Ask for a copy of our Bulletin, "Water,—But No Corrosion."

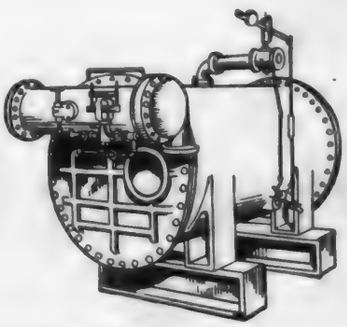
ELLIOTT COMPANY

Pittsburgh, Pa.

General Sales Offices: Jeannette, Pa.

District Sales and Service Offices: Atlanta, Baltimore, Boston, Cincinnati, Cleveland, Chicago, Detroit, Kansas City, New York City, Philadelphia, Pittsburgh and St. Louis

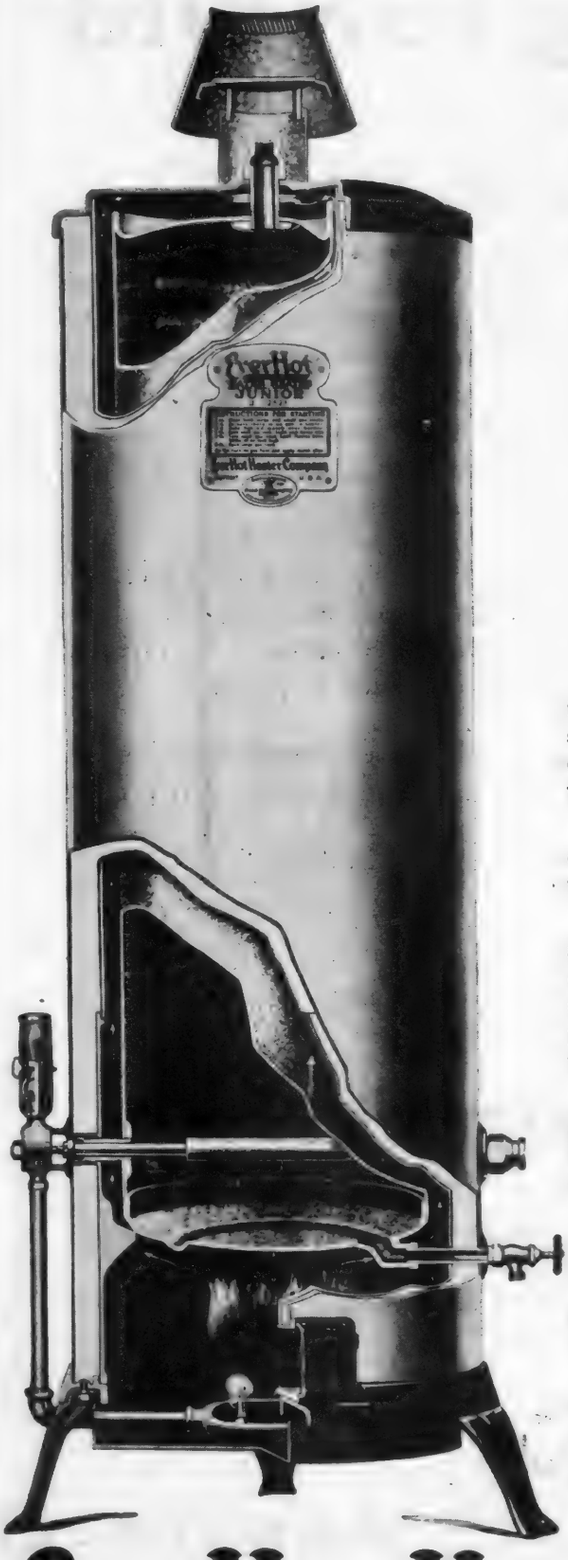
De-oxygen-ating Deactivators



Apparatus Deaerators

N-832

Some of the Features of the EverHot AUTOMATIC WATER HEATER



1—Heating Surface.
2—Burner.
3—Thermostat.
4—Absence of Condensation.
5—Freedom from Liming.
6—Freedom from trouble.

2—The Burner

The EverHot Burner will not burn back-fired. In this respect it differs from all others. When it is understood what damage can be done by a back-fired burner in any kind of a water heater—the EverHot burner will be duly appreciated.

The flame is non-carbonizing. The combustion is complete. No part of the flame comes into contact with the heating surface.

The burner has an unlimited turn-down. This enables it to function as the pilot light. This simplifies construction—reduces the possibility for trouble—and any seepage through the thermo valve is burned in the pilot and utilized. In the other types, any seepage is wholly wasted.

The EverHot burner is just as efficient after years of service as it is when new. It is also just as efficient as a bunsen burner, when the bunsen burner is new and clean.

It is simple in construction, no mechanical mixers —no gauzes or other parts to give trouble.

The EverHot burner is responsible to quite a degree for the freedom from the necessity for service and repairs that characterizes the EverHot Heater.

Next issue subject No. 3 "The Thermostat" will be treated. Subject No. 1 "Heating Surface" was treated in last issue of Heating and Ventilating.

Prices
Baby Grand $66 — Junior $99 — Senior $160

EverHot Heater Company

5215 WESSON AVENUE **DETROIT, MICHIGAN**

ARCO
PACKLESS VALVE
is made for steam, water, and vapor (fractional type). Angle, corner, globe patterns. Round or lever handle.

At last

a moderate priced Packless Valve you can use on any job

A SMOOTH turning, quick opening, non-leaking, good looking valve — that is *not* high priced!

There have doubtless been many times when you have wished for just such a valve; when you felt that a job required a good type of Packless Valve, but price wouldn't permit it.

Order a sample ARCO Packless Valve today. The price will please you and you can use the valve on any job.

AMERICAN RADIATOR COMPANY

IDEAL Boilers and AMERICAN Radiators for every heating need

1807 Elmwood Ave. Dept. S Buffalo, N. Y.

Re-enforced Packless
for Hot W

FOR GENERAL RESIDENCE AND BUNGALOW HEATING, the MODERN IMPROVED, CLOSED OR SEALED, DAMPER REGULATED HOT WATER SYSTEM, is fast displacing vapor and vacuum steam heating. WHY? BECAUSE A MORE UNIFORM HEAT CAN BE MAINTAINED WITH LESS CARE AND COST OF FUEL THAN IS POSSIBLE WITH STEAM.

FOR ILLUSTRATION, with a steam system to allow fire in boiler to drop to a point sufficient to allow water temperature to fall below 212 degrees you are without steam and, as a consequence, without heat, cold rooms, while with this same fire you would have sufficient hot water heat circulating through system to maintain comfortable rooms until fire could be replenished without the usual 3 o'clock in the morning attention.

THE IMPROVED closed or sealed hot water system is set to operate under a given pressure at a given boiler heat temperature and, therefore, to maintain a closed or sealed system and get best results possible you MUST HAVE A *SEALED* VALVE WHICH IS NOT POSSIBLE WITH A PACKED VALVE.

TO BE MORE EXPLICIT, the satisfactory operation of a CLOSED OR SEALED SYSTEM DEPENDS UPON THE LAW OF EXPANSION OR CONTRACTION OF WATER according to degrees of heat temperature and for a valve, as pressure is increased above point at which system is set, to leak through top, or as system cools below a certain degree of temperature creating a vacuum, to suck in air through packing around stem, creating air pockets in system, WILL, OF COURSE, *VERY SERIOUSLY* INTERFERE WITH BEST RESULTS POSSIBLE.

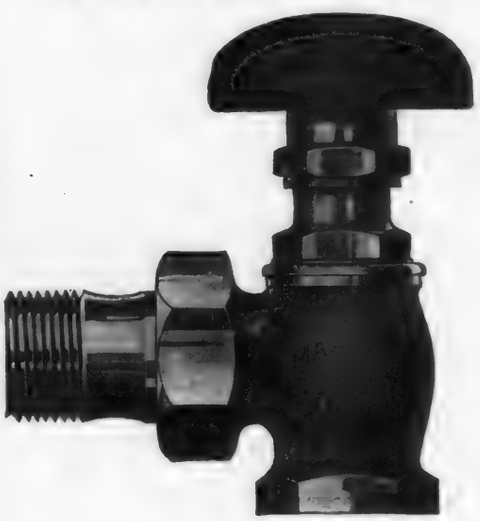


Fig. 137

There are several types of packed water valves in use.

The Cylinder type, because of its cheap construction, is most prevalent but which, because of construction, will corrode and cannot be opened or closed after a short time in service, and for this reason is unsatisfactory. THIS TYPE TOGETHER WITH ALL OTHER COMPETITION VALVES, whether with rising or non-rising stem, ARE PACKED, and THEREFORE AN IMPERFECT SEAL, and ENTIRELY UNSATISFACTORY for the present improved modern system of water heating.

MARSH RE-ENFORCED PACKLESS HOT WATER VALVES ARE GUARANTEED; FIRST, NOT TO STICK, REGARDLESS OF TIME IN SERVICE, and SECOND, NOT TO LEAK THROUGH BONNET AT ANY PRESSURE.

A GENUINE PACKLESS WATER VALVE at practically competition prices.

These valves are quick opening, with circulating capacity 50 per cent more than full pipe waterway, and are GUARANTEED

Something Entirely New

WE HAVE MADE A SPECIAL STUDY of hot water heat regulation and control and are pioneers in the matter of individual radiator control, through a graduated valve, employing the same principle as with steam. If you can modulate, graduate, or regulate individual radiator vapor or vacuum steam heat through a valve (and you can), then why not by the same principle regulate water heat, and, for that matter more consistently than steam, as with water you have something to regulate, while with steam, to allow fire to drop below a given point, you have nothing.

FOR SLEEPING ROOMS, heat regulation with the MARSH GRADUATED water valves may be controlled with the SAME EASE OF OPERATION and CERTAINTY OF RESULTS as is possible with a Modulated valve on

MARSH VALVE COMPANY

EXCLUSIVE SAL

Appleton & Liptrott, Inc.

Edward T. Hetherington, 1718 Sansom St., Philadelphia, Pa.

United States Radiator Corp'n, General Offices: Detroit, Mich.

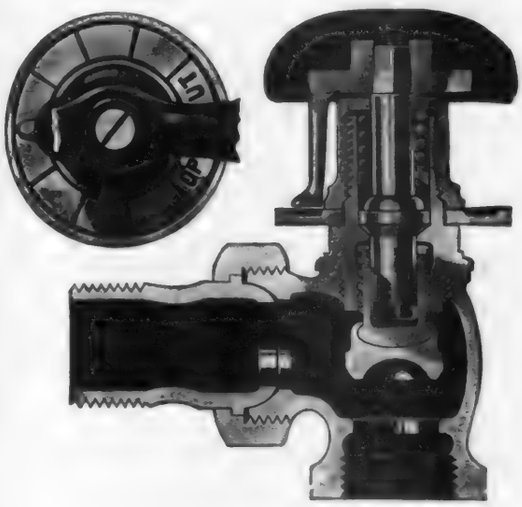
All territory east of West lines of Michigan and Ohio and north of Virginia, except New York and Philadelphia.

Packed Valves Heating

to hold ANY PRESSURE radiation will stand. We have thousands of these valves working on 50 to 85 pounds pressure, giving entire satisfaction.

OVER 1,000 OF OUR PACKLESS STEAM VALVES have been in operation over five years, on a forced hot water job, in a large 12-story hospital on which static and pump pressure for lower floors is over ... pounds and for upper floors about 45 pounds, without a leak.

Engineer and contractor for the above job, last year installed about 900 of our new GRADUATED water valves, same packless construction as for Hospital job, for a forced hot water system in a 9-story Library building. THIS IS EVIDENCE OF CONFIDENCE.



Packless Feature

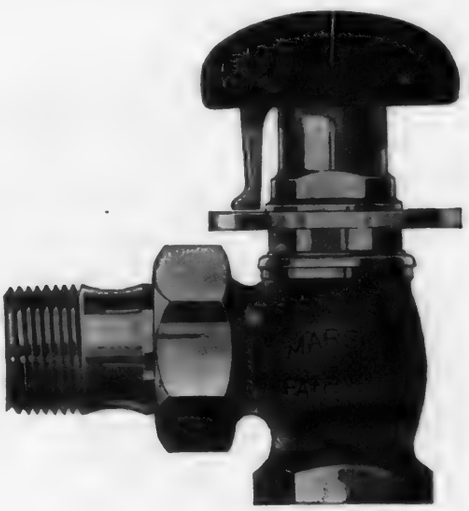


Fig. 139

Water Heat Regulation

a steam system, and AT A MUCH LESS COST THAN FOR A VAPOR OR VACUUM SYSTEM INSTALLATION. FURTHER, water circulation for each radiator, graduating for same OR BALANCING OF SYSTEM, can be increased from nothing to full pipe capacity and HELD OR LOCKED AT ANY INTERMEDIATE POINT, if desired, by simply turning dial so that stop on same will register against indicator or pointer and locking dial in this position, preventing further opening of valve or turning of wheel or lever handle to the left.

THESE VALVES COST BUT LITTLE MORE than our regular water valves and MUCH LESS THAN STEAM MODULATED VALVES.

Plant and General Offices: **Dunkirk, N. Y.**

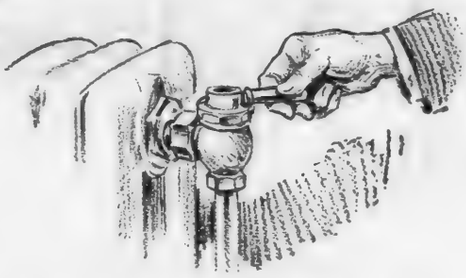
TRIBUTORS:

roadway, New York City

John W. Maabs, 431 S. Dearborn St., Chicago, Illinois.

Jas. P. Marsh & Company, 118 So. Clinton St., Chicago, Ill.

All territory south of Ohio River and west of Michigan and Ohio, except Cook County, Chicago, Ill.



CONSISTENCY

The most essential feature in connection with any heating system, and a marked advantage of a Dunham Installation

THE importance of *consistency* in a heating system can hardly be exaggerated. If a constant, day-after-day record for satisfactory performance cannot be counted upon, then the very words "heating system" are a misnomer.

Dunham Heating is noted for its consistent performance in all types of buildings, in any climate, and under the most variable of weather conditions. These furnish the real tests of a good heating system.

At the turn of the Dunham Inlet Valve, shown above, a valve most conveniently placed at the *top* of the radiator, the desired degree of heat may be secured and controlled *at the radiator*, and *maintained with consistency.*

When the weather is extremely cold a Dunham Heating System provides an abundance of warmth. Our lower illustration shows a typical view of a corner of a Dunhamized home on a winter day. Here solid comfort is a reality and not a "happenstance"—heat when you want it, where you want it, and *all* you want *of* it, day in and day out, year after year. In milder weather the exact indoor temperature most comfortable at the season is available in every room of the Dunham Heated home. The system is silent, flexible, durable and economical.

Consistency in a heating system can find no more outstanding example than is offered by the Dunham Low Pressure Steam Heat.

C. A. DUNHAM CO.

230 East Ohio Street, Chicago

Over sixty branch and local sales offices in the United States and Canada bring Dunham Heating Service as close to your office as your telephone. Consult your telephone directory for the address of our office in your city.

The DUNHAM
REG. TRADE MARK
HEATING SERVICE

The Heart *of the* Heating System

Every Member of—

The National Piping and Heating Contractors' Association,

Who Installs—

The American Society of Heating and Ventilating Engineers,

Who Uses—

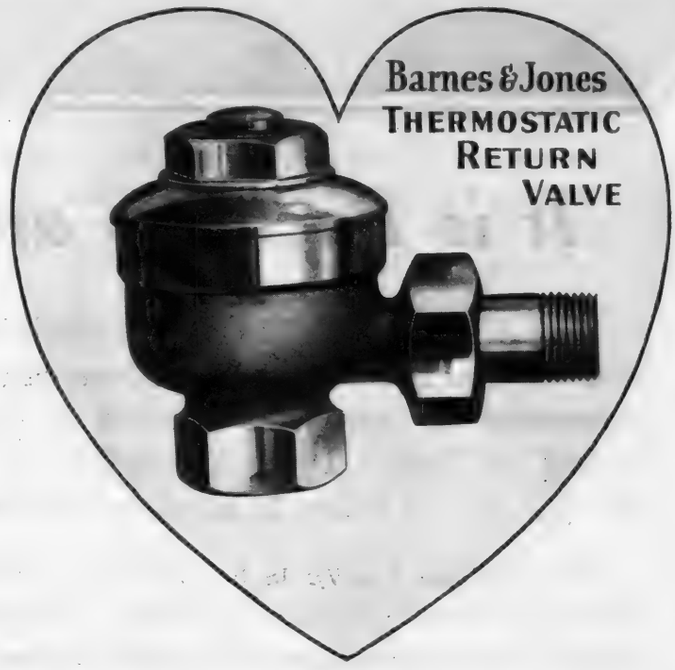
VAPOR or VACUUM HEATING SYSTEMS

Knows That—

The "HEART" of a Heating System

always is the—

Thermostatic Return Valve.



When the Engineer Specifies or the Contractor Buys Return Valves—

He Wants—

Day-in-and-day-out Reliability—Efficiency—Service

When He Buys—

BARNES & JONES HEATING APPARATUS

He Gets—

All of These Results in an Apparatus that is Built on 25 Years' Experience.

Barnes & Jones

Modulation Vapor and Vacuum Heating Systems of Proven Quality

5 Melrose Street Boston, Massachusetts

The ADSCO Valve

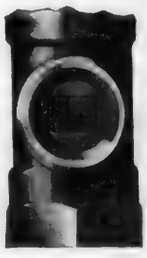
Sturdy, Compact, Well-Balanced and Attractive

It is Packless and Graduated

Any desired percentage of a radiator's area can be used. Each room's temperature can be regulated independently, assuring comfort to occupants and saving of fuel. Interchangeable orifice—inserts suit one size of valve to all sized radiators.

The Adsco Valve is a "Thing of Beauty." Full nickeled brass, highly polished, it gives the final touch of rich simplicity to a perfect heating system.

Clip the coupon—send for full information about Adsco Heating



This shows the calibration feature. The oblong orifice assures proper opening and control. The inserts are interchangeable.

A three-quarter turn will open or close the valve completely.

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS

NORTH TONAWANDA, N.Y.

Offices:

New York Chicago Seattle

Agents in principal cities in U. S. and Canada.

ADSCO HEATING

AMERICAN DISTRICT STEAM COMPANY North Tonawanda, N. Y.

Send me more information about the

☐ ADSCO Packless Graduated Radiator Valve

☐ ADSCO System of Atmospheric Steam Heating

Name .....

Address .....

H-4

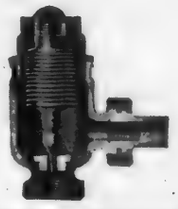
Sylphon Bellows Patent Upheld!

THE FULTON COMPANY have received a favorable decision in their suit against the Bishop Babcock Company in the District Court of the United States for the Northern District of Ohio, Eastern Division. By decision dated February 13, 1925, District Judge Westenhaver held The Fulton Company patent No. 971,838 to be valid and infringed by the Bishop Babcock Company, and by a decree signed by Judge Westenhaver on May 15, 1925, the Bishop Babcock Company are enjoined from infringing this patent or using the process of this patent in the manufacture of bellows.

Webster Sylphon Traps and Webster Sylphon Packless Valves embody the Sylphon Bellows manufactured by The Fulton Company under the process of Fulton patent No. 971,838. *Warren Webster & Company are sole licensees for the use of the famous Sylphon Bellows in this type of apparatus.*

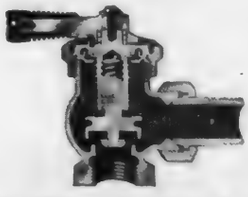
Millions of Webster Sylphon Traps and hundreds of thousands of Webster Sylphon Packless Valves, as used in Webster Systems of Steam Heating, are daily proving the superiority of the Sylphon Bellows principle which is obtainable only in Webster Equipment.

Specify Webster Systems to make sure of the highest development in steam heating.



The Webster Sylphon Trap

One of almost thirty different appliances, used as needed in Webster Systems of Steam Heating. More than 2,000,000 have been installed.



The Webster Sylphon Packless Quick-Opening Valve

Another of almost thirty different appliances, used as needed in Webster Systems of Steam Heating. More than 300,000 have been installed.

Warren Webster & Company

Pioneers of the Vacuum System of Steam Heating

Camden, N. J. 50 Branch Offices

In Canada, Darling Bros., Ltd., Montreal

- since 1888

Webster Systems of Steam Heating

More than 34,000 installations in America's finer buildings

Mouat System Operates on 1 to 2 oz. Pressure

Perfect Control—

The primary object of the Mouat System is to permit a positive hand control of the heat at each radiator, making it possible to regulate the temperature in each room.

This is accomplished by partially opening or closing the radiator supply valves, allowing only a portion of any radiator to become heated. Any radiator may be turned on fully or closed off completely.

Shaded portions of the radiators in the diagram below show how the heat in the radiators can be graduated or controlled as desired.

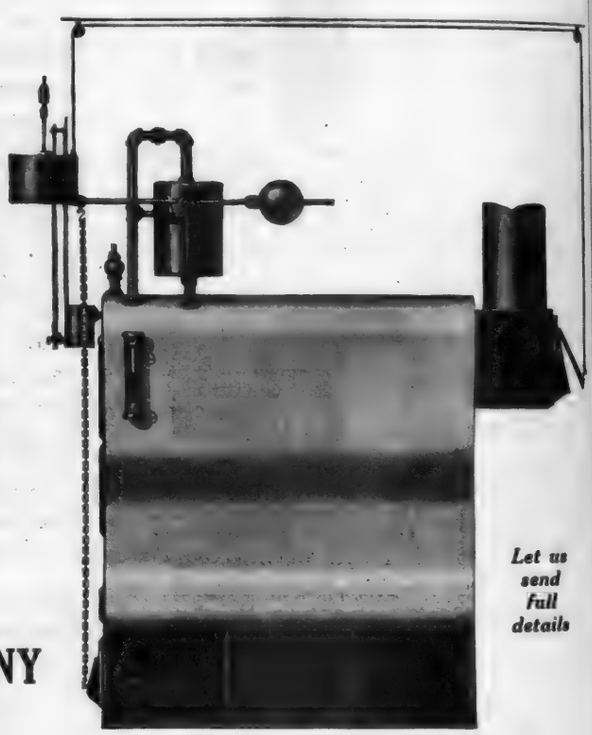
Perfect Regulation—

The Mouat System of Heating, a two-pipe gravity vapor or atmospheric steam heating system, operates at from 1 to 2 ounces pressure. No pumps, thermostatic valves, return traps or mechanically operated parts.

This extremely low pressure is maintained by the Mouat Damper Regulator, sufficiently sensitive to operate at a variation of less than one ounce. This regulator is not affected by high, low, or unsteady waterline, since the working parts are connected above the waterline of the boiler. No water can be forced out of the boiler through the regulator.

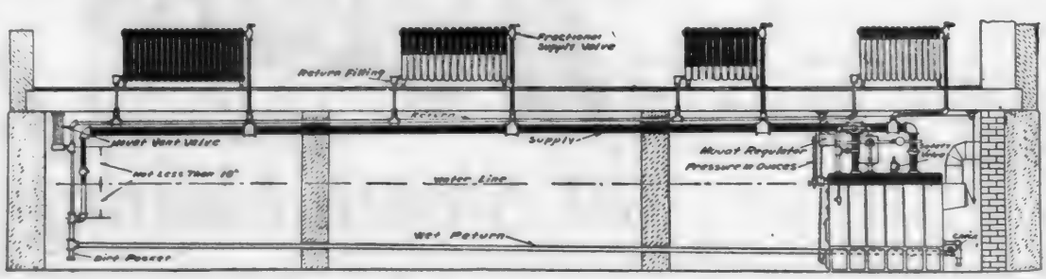
This regulator can also be used to reduce steam pressure to vapor pressure on central station heating plants.

The accompanying illustration shows a typical installation of a Mouat Damper Regulator.



Let us send full details

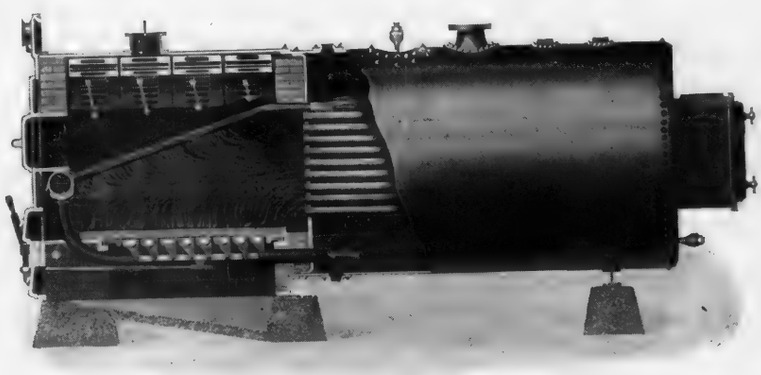
MOUAT VAPOR HEATING COMPANY
CLEVELAND, OHIO



Showing how the Heat can be Graduated or controlled

Stanwood

SMOKELESS BOILERS



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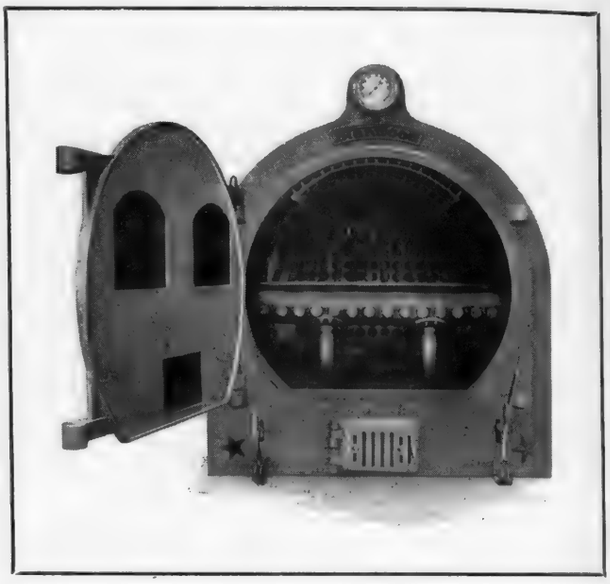

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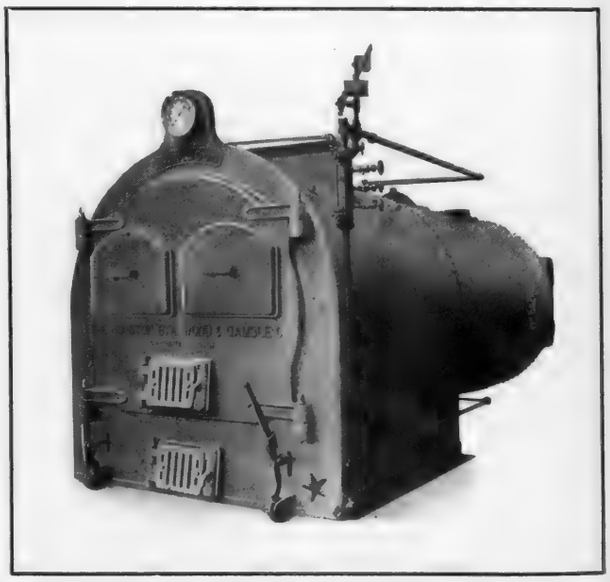
Built for heating at 15 lb. working pressure.
Built for power at 125 to 200 lb. working pressure.



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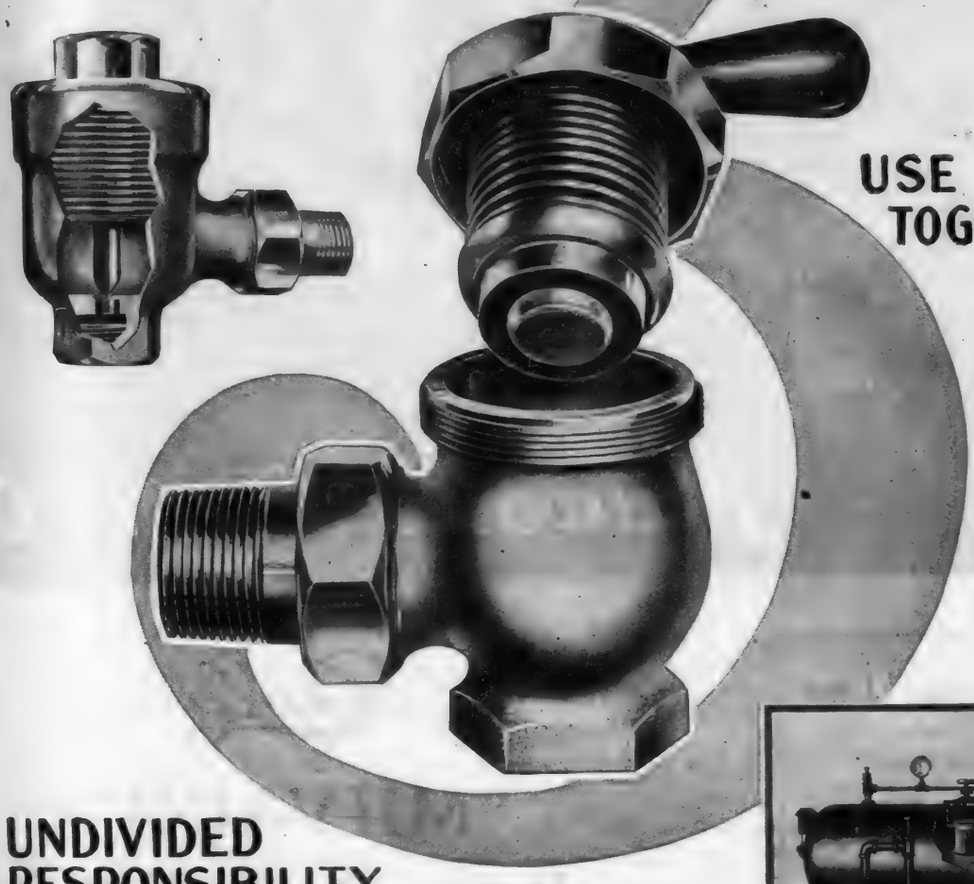
BOILER BUILDERS SINCE 1891

TRANE'S BIG THREE

BELLOWS PACKLESS VALVE • BELLOWS TRAP • VACUUM PUMP



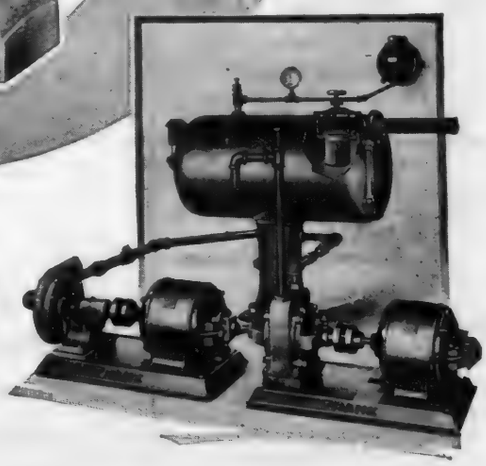
USE THEM TOGETHER

UNDIVIDED RESPONSIBILITY

TRANE BELLOWS TRAP—14 corrugations. Bellows 1¾" in diameter. Brass body. Normal range 15" vacuum to 25 pounds pressure. Guaranteed 5 years. Described in Bulletin 14.

TRANE BELLOWS PACKLESS VALVE—Absolutely packless in every respect. Contains genuine Trane Bellows. Brass body. Indestructible handle. Described in Bulletin 14.

TRANE VACUUM PUMPS—Separate Case Construction. Single or two-motor drive. 350 combinations. Pedestal type tank with built-in strainer. Less motor horsepower for a guaranteed capacity than any other vacuum pump ever designed. Described in Bulletin 20.



Write for the Trane Bulletin Binder, describing the entire line of Trane Heating Specialties and Trane Pumping Equipment.

HEATING TRANE PRODUCTS PUMPING

THE TRANE COMPANY, 206 Cameron Ave., La Crosse, Wis. Manufacturers of vapor and vacuum heating specialties and pumps. Branches and sales connections at New York, Chicago, Boston, Philadelphia, Buffalo, Cleveland, Detroit, Seattle, Los Angeles, Albany, Minneapolis, Salt Lake City, Ft. Wayne, Portland, Oregon, Greensboro, N. C., Zanesville, Ohio, Atlanta, Ga. In England: 22-23 Clerkenwell Close, London, E. C. 1. In Canada: The Trane Co., 23 River St., Toronto; Thomas Robertson & Co., 134 Craig St., West, Montreal; F. S. Murdoch, 310 Breadalbane, Winnipeg. In Japan: The Uchida Trading Co., Ltd., Tokio—Osaka—Kobe. In China: C. J. Doughty & Co., 7, Jinkee Road, Shanghai.

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Throttle Valves Cross Valves
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Direct Return Traps
Air Line Valves
Thermostatic Traps
Air Eliminators
Quick Vents

Underwriters Approved Valves

Gate Valves
Angle Valves
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MILVACO
MILWAUKEE VALVE CO.

Dole

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Packless Radiator Valve

—always manufactured by us and, until recently, sold through The Dole Valve Company of Chicago, this nationally known packless radiator valve will henceforth be marketed through the sales organization of the Milwaukee Valve Company, Milwaukee, Wis.

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MILWAUKEE VALVE CO. MILWAUKEE, WISCONSIN

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The trouble caused by clogging nozzles—so common to air washers of the multiple spray, small orifice type—is eliminated by the Bayley Turbo Atomizer with its large orifice fire type nozzle.

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Investigate any of the following representative installations: Illinois Steel Co.,—Chicago, Joliet, Clinton Corn Syrup Refining Co., Clinton, Iowa; Penick & Ford, Ltd., Cedar Rapids, Iowa; Chrysler Motor Corp., Detroit, Mich.; Masonic Temple, Ann Arbor, Mich.; International Milling Co., Moose Jaw, Saskatchewan, Canada; Roosevelt High School, Des Moines, Iowa; Central Hotel, Lincoln, Nebr.; Proctor & Gamble Co., Port Ivory, N. Y.; Pittsburgh Plate Glass Co., Milwaukee, Wis.; Simmons Co., Kenosha, Wis.; First Baptist Church, San Antonio, Tex.; Canada Malting Co., Ltd., Winnipeg, Canada; Ford Motor Co., (Branch) Houston, Tex.; Pacific Baking Co., Los Angeles, Cal.; Taksago Kogyo Co., Ltd., Yokohama, Japan; Allegheny County Court House, Pittsburgh, Pa.

Write for Bulletin No. 25 giving complete information on the Bayley Turbo Air Washer.

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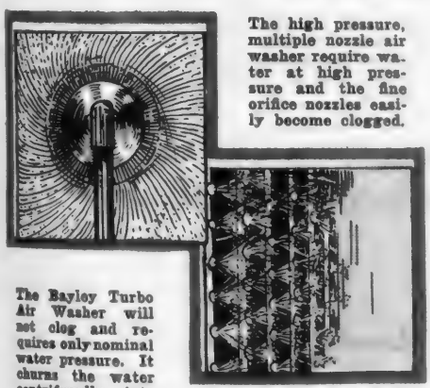
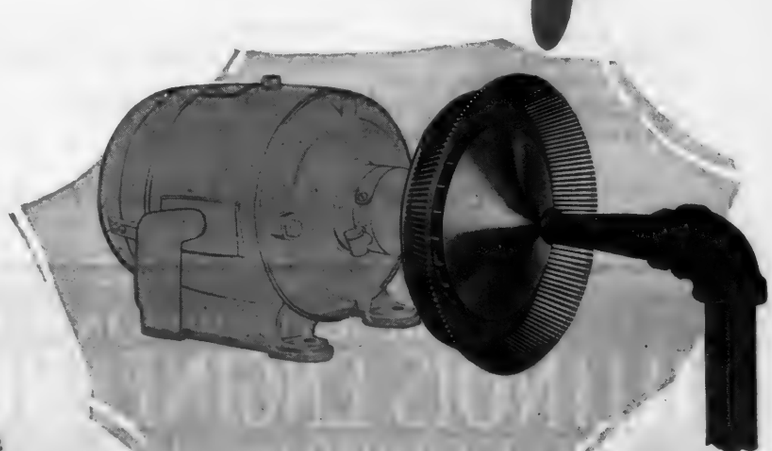


The high pressure, multiple nozzle air washer require water at high pressure and the fine orifice nozzles easily become clogged.

The Bayley Turbo Air Washer will not clog and requires only nominal water pressure. It churns the water centrifugally into a dense even spray.



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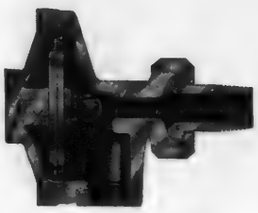
MILL EXHAUSTERS—PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS

Will Not Clog



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The Original Vertical Seat Trap
Dirt Proof—Positive Action—Long Life

Illinois Modulating Radiator Valve
Packless—Quick Opening—Leak Proof
Absolutely right under 50 lbs. pressure

TWENTY-FIVE years of concentration on a specific problem—the production of a better heating system—that is what we look back upon. Building surely—making certain of the worth of each new product before it was marketed—relieving our customers of the danger of experimenting—and—finally, standardizing on certain designs.

All of this experience and the facts accumulated as a result of it, we offer to you today in ILLINOIS HEATING SYSTEMS—tested and practical—all guess-work eliminated.

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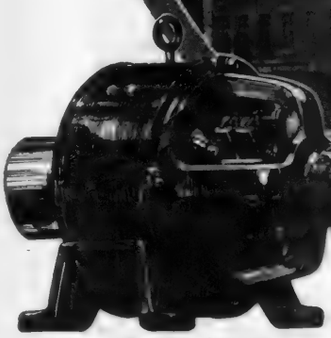

Westinghouse SK Motor

Divide the cost by the years they last

Westinghouse Serves *in America's Finest Hotels*

THE new Benjamin Franklin Hotel at Philadelphia is representative of many of the country's modern hotels in which Westinghouse SK motors were chosen for the heating and ventilating systems.

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This insulation adds years of life to the coils by making them absolutely proof against high temperature or moisture.

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Rolled steel forms are used in the more common ratings of SK motors assuring absolute uniformity of the magnetic circuit.

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the United States and Foreign Countries

Westinghouse

X 80683

Correct Size Boile by Novelt

4 different questions by four different steamfitters ~

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The second steam fitter asked: "How much grate surface in this boiler" ?

The third steam fitter asked: "How much coal will it burn per hour" ?

The fourth steam fitter asked: "What size flue is required for this boiler" ?

These and all other questions bearing on the subject of boiler selection are answered by the Novelty Boiler Selection Plan of the Abram Cox Stove Company. This plan is explained in the new Novelty Handbook and it has been hailed as the most helpful method ever devised for determining ***accurately*** the right size boiler for a given job.

NOVELTY BOILERS

ABRAM COX STOVE CO.

Quickly Determined Selection Plan

Boiler Ratings Abandoned

AT ONE stroke the Abram Cox Stove Company has done away with the confusion which has troubled the steam fitter for years, as a result of continuous raising of ratings on boilers.

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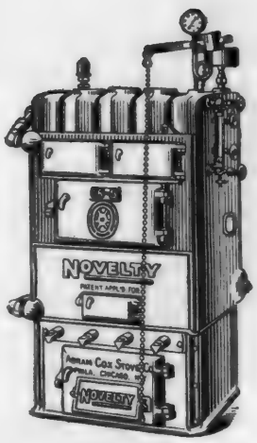
The Novelty Boiler Selection Plan is contained in the new Novelty Handbook, which is published for trade distribution only. Turn to one of the tables in this book and you will find that when you select a boiler according to flue conditions, your job is automatically balanced.

You must see the Novelty Handbook to appreciate fully how it simplifies the selection of a boiler. It is written in A. B. C. language and eliminates guess-work absolutely. Be sure to write us for your copy.

Address Department H-7 at the Nearest Office



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Established 1847

American and Dauphin Streets - - PHILADELPHIA

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Name .....

Address .....

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Seamless One-Piece Multiflex Metal Bellows

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The Company is entirely independent of all outside sources of supply for delivery of the finished product and the responsibility for perfection of the article. Bishop & Babcock Multiflex Bellows have always been made in our own plants. You can depend on products which carry with them the trade name MULTIFLEX.

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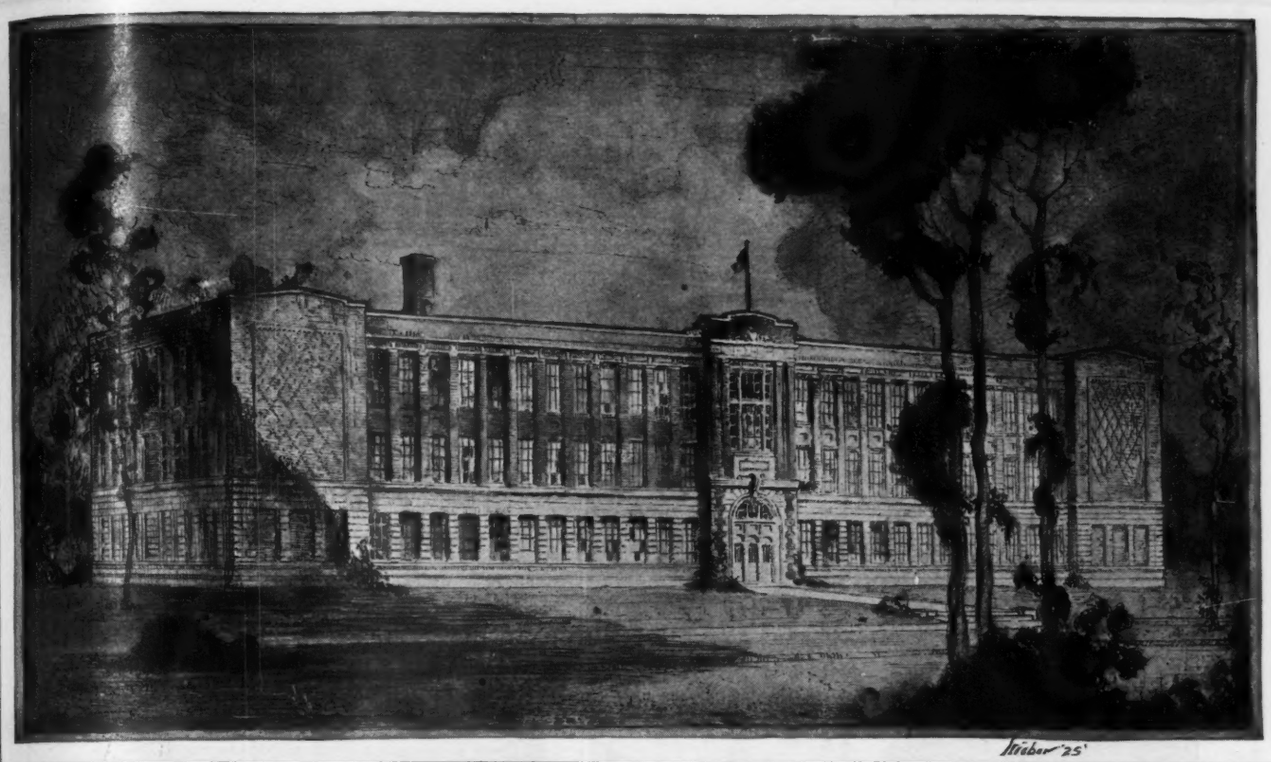

CONSOLIDATED SCHOOL, TIPTON, IOWA, UNIVENT EQUIPPED, C. F. ROCK PLBG. & HTG. CO., ST. JOSEPH, MO. *Contractors*
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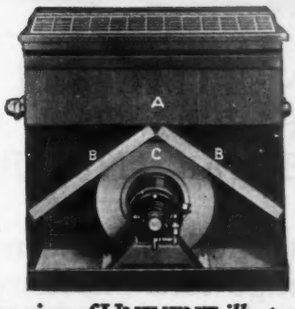
Heating and Ventilating Engineers Find Big Profit Fields with Univent



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A.—Copper radiator without a single joint, absolutely leak-proof.

B.—Air filter easily removable for cleaning.

C.—Cone type fan specially insulated for quiet operation.

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And in Kansas City—

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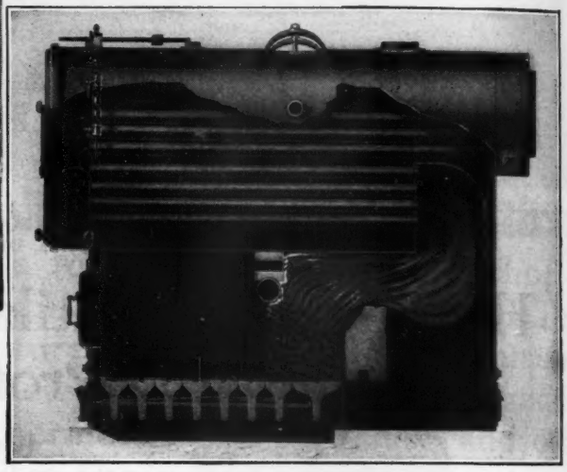
Architect: McKecknie & Trask.
Heating Contractor: The Pratt Thompson Co.



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Just look up "Heggie-Simplex Boiler Co." in the phone book in any of the above cities for representative's number and address

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JOHNSON

Probably you would wish to have someone with whom to discuss the advisability of installing The Johnson Pneumatic System of Temperature Regulation, someone who has actually experienced the remarkable fuel economy and the physical comforts and conveniences provided by the Johnson System, home and building owners who have The Johnson installed. No doubt there is someone in your city, or close by. Johnson perfection, services, results and refinements deserve thorough consideration as essential today. Write immediately for a list of homes or business structures Johnson equipped: most respectfully furnished upon request.

JOHNSON SERVICE COMPANY, MILWAUKEE

AUTOMATIC TEMPERATURE REGULATION FOR 38 YEARS

TWENTY-EIGHT BRANCHES UNITED STATES AND CANADA

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